POPULAR AVIATION

Including SOUTHERN AVIATION and AERONAUTICS

A MAGAZINE FOR THE PROMOTION OF AMATEUR AVIATION AND PRIVATE FLYING

Volume XIV | MARCH, 1934 | Number 3

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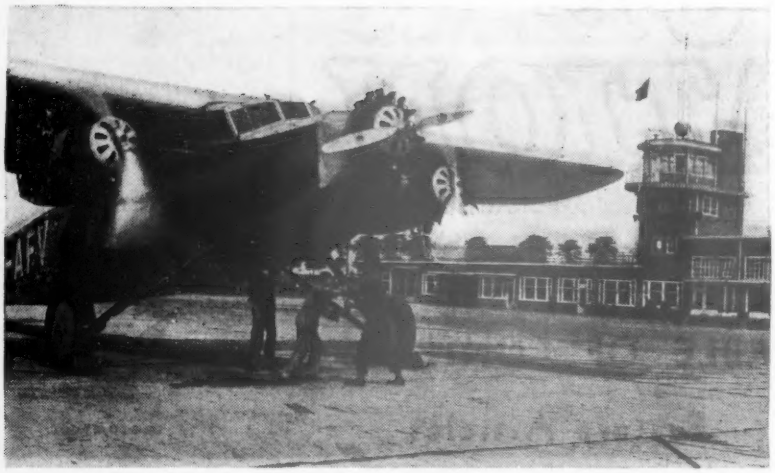
POPULAR AVIATION, Volume 14, Number 3, March, 1934. Published monthly by Aeronautical Publications, Inc., at 608 South Dearborn Street, Chicago, U. S. A. William B. Ziff, Publisher; B. G. Davis, Editor; John B. Rathbun, Managing Editor. New York Office, 551 Fifth Avenue, New York City. Subscription $2.50 per year, single copies, 25 cents, foreign postage, $1.00 per year extra. Contributors are especially advised to retain copy of their contributions, which must be accompanied by return postage. All such material will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Any copy accepted is subject to revision or changes to meet the requirements of this publication. Payment for copy used will be made at our current rates. Entered as second-class matter, January 24, 1933, at the Post Office, Chicago, Ill., under the act of March 3, 1879. Additional entry, Springfield, Ohio.

European Air Transport

by

G. V. BROWN

Statician and analyst for aerial transport operations.



A tri-motor passenger transport on the KLM lines of Holland. While a very small country, Holland has been very active in the development of long distance service to her oriental possessions.

THERE seems to be many illusions concerning European aviation existing among people in this country—the laymen, air enthusiasts and even men in the industry.

The majority of Americans think, because European nations established regular passenger transport services right after the War, that they still must be farther developed than we are. Regular air transport services were established in all of the principal countries of Western Europe five years before the first passenger line started here in 1924.

The British were the first to enter the field, inaugurating service on the London-Paris route in 1919 and within the next year, companies were organized in other European countries. They had five years' experience in the actual operation of air lines before the first passenger service began in the United States. But the development in the U. S. has been so rapid that there are now very few points on which an unbiased observer would today concede any superiority to the European lines. The services on this side of the Atlantic are faster, safer and cheaper.

The average European transport plane has a cruising speed of 105-120 m.p.h. compared with the 160-180 m.p.h. of planes used on American routes. And as to safety, no European company can touch the fine record of United Air Lines—seven years without a fatality. The fares, except those in Germany, are substantially higher in Europe. The passenger fare on the most heavily-travelled route in Europe, the London-Paris airway, amounts to 10 cents per mile or $22.50 for the 225 mile flight while it costs about 6½ cents per mile to fly from New York to Chicago, the most popular route in this country.

In Europe, commercial aviation is closely allied with military aviation, in contrast with the situation here where the two are separated altogether. The Department of Commerce regulates civil flying, the separate divisions of the U. S. Army and Navy handling aerial defense problems.

In Europe, every country has created an Air Ministry, a new department in the government, to regulate and oversee the development of *all* branches of aviation. That is, the responsibility for both military and commercial aviation is centralized in one man—the Minister of Air. There is no doubt that every European Government is interested in the development of a powerful air force.

Fostering aviation in its early years is looked upon as a government obligation in Europe, absolutely necessary to adequate military defense and as a project to be carried on at any cost to the tax-payer. The Governments are particularly anxious to establish strong military air forces but are not overlooking the possibilities of their commercial services as a reserve available in time of war. Not one of them is willing to allow its own commercial aviation activities languish while its neighbors, and perhaps enemies, build up a strong manufacturing and transport industry.

This desire to assist commercial aviation has led to competition among the various countries in voting direct subsidies to the air transport companies. Every nation in Western Europe subsidizes its transport companies directly by an out-and-out grant, contrary to the practice here of granting an indirect subsidy through the air mail contracts. England is the only country that has any definite plan of gradually decreasing subsidies over a certain period until finally air transport services can support themselves through ordinary commercial revenue.

England hopes to achieve this goal in 1939. That date already represents a set-back of five years as the original subsidy plan called for no payments after 1934. But in 1929 it was realized that traffic revenues were not coming in as well as had been expected and a new ten-year schedule of payments was drawn up. In Germany, France and Italy, the subsidies are voted annually and, on the whole, have been increased yearly. There is no definite plan to gradually reduce them to zero by a certain date.

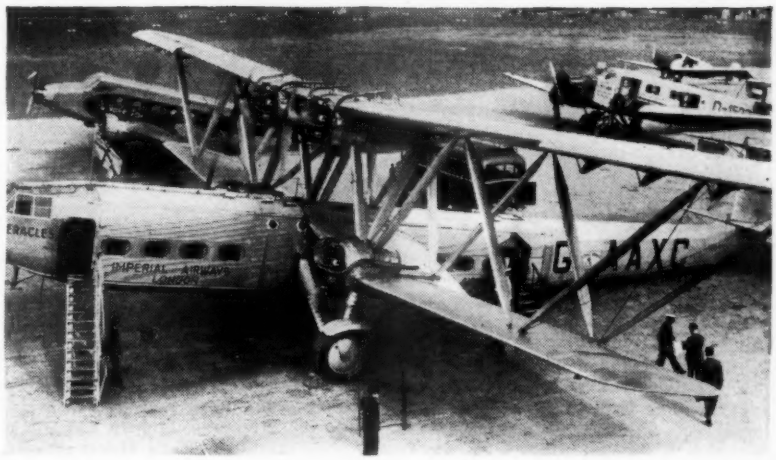
Another outgrowth of the govern-

The "Breda 32," an Italian tri-motor equipped with Wasp, Jr., engines. This plane is typical of the passenger transports on the Italian lines.

Lines Exist on Subsidies

HERE we have the whole story of European airline transportation prepared exclusively for POPULAR AVIATION *by Mr. Brown after a careful study of conditions during his recent European trip.*

It is quite interesting to note that American tourists contribute about 56 per cent of the European airline patronage, a fact that rather contradicts the popular belief that "air-travel in Europe is as commonplace as riding on the street-cars."



In the foreground is a British "Heracles" type biplane employed on the Imperial Airways. Directly behind it is a French airliner of the "Air-France," while in the upper left hand corner is a transport belonging to still a third European airline. Photo taken at Croydon Airdrome, England.

ment control of aviation has been the establishment in each country of one big company or "trust" which enjoys a monopoly of all the subsidies. England, Germany and France have all done this.

In England, it is the Imperial Airways; in Germany, *Deutsche Luft Hansa*, and in France, an amalgamation of the five companies into one, called *Air-France*, which took place in September, 1933. Belgium has its *SABENA* and in Holland it is the *KLM* line. This one company in each country operates practically all the air transport services. There are, it is true, a few independents but, in view of the fact that they receive no subsidy, their existence is short-lived—less than six months, usually.

The competition, then, is international rather than internal among the companies within each country. And the routes flown are international. Most European countries are so small that commercial air routes *within* the country are not profitable. The railways are, in general, fairly good and the air transport operators cannot hope to compete with them on a short run.

There are practically no internal regular air services in the British Isles and the only route in France, which has both terminals within the country is Paris-Lyons-Marseilles, a distance of 500 miles from the North to the South of France. Italy has a few air routes connecting its principal cities but they are continued on to other countries and cater chiefly to international traffic. Belgium, Switzerland and Holland are so small, of course, that there is no sense for starting internal services. In those countries, a person couldn't fly more than an hour in any direction without going outside of the country. Hence, it is foolish to speak of a "network" of air lines in the above-mentioned countries.

Flying, therefore, on European skyways is over international routes. The important routes—London-Paris, London-Berlin, and Paris-Vienna—all involve flying over one or more foreign countries. Before this can be done, an agreement between the governments concerned must be concluded. And that is where the friction has developed in the past. The jealousies of certain nations have been exhibited by their refusal to allow planes of foreign companies to make use of their airports or even to fly over their country without landing.

This international political jealousy constitutes, in my opinion, the chief hindrance to the further development of European aviation. After England decided in 1925 that a 5000 mile route to India was technically feasible and commercially desirable, it took four years of negotiation with countries along the route before the political difficulties had been ironed out.

The opening of this route, which could have taken place in the latter part of 1925, was delayed until 1929. And they have had to change the route twice since 1929 because certain countries have kicked over the traces. Air transport companies in other countries have had similar experiences.

Probably the most disastrous result of this political jealousy has been the suspension of night-flying. At present, there isn't a single plane of any European transport company in the air after dark. This is in contrast with the situation in the United States where some companies fly more than half their mileage and carry most of the mail at night. As yet there are no European airways properly lighted for night-flying. Each country refuses to light its own airways at great expense,

Just a suggestion of the seating capacity of the English "Heracles" transports. There are 36 school boys, two teachers, two pilots, and a steward.

because foreign planes would make use of their facilities.

As yet, no international agreement to make night flying possible has progressed past the most elementary stages. In 1929, the French *Air-Union* company operated a night service between Paris and London but it made the unenviable record of completing only 56.5 per cent of its scheduled trips. The service was discontinued in the winter season and never started again.

Lack of night service gives rise to a great difference in the character of European and American air passenger traffic. Whereas business men are the chief patrons of our lines, in Europe the tourists constitute the major portion of passenger traffic. The reason for this is very simple. A London business man wishing to be in Paris the next afternoon might just as well leave by the de luxe train on the night before as to rush to the airport in the morning. In any case a business man spends most of his working day en route. He can't possibly travel without losing business time.

As no mails are flown at night, there is little business time to be saved by using the air mail. There are a few instances where it is actually quicker to send a letter by train. An air mail letter to Paris, posted in London after 3 P. M., must lie over-night in the post-office and is carried to Paris on the first morning plane, arriving at noon. The same letter sent by ordinary mail is put on the fast evening train-and-boat-service and is delivered in Paris the first thing in the morning.

Tourists then, principally Americans, are the ones who ride the European sky-ways. It is interesting to note what a great percentage of all passengers carried by European companies are from this side of the Atlantic. One European company reported in 1931, that 56 per cent of the passengers were Americans. European air lines, particularly the French and English lines on the popular London-Paris

Here is an old friend in Switzerland. It is an American Lockheed "Orion" employed by "Swissair" and is the fastest transport in Europe. Additional "Orions" have been added recently.

route, have been affected greatly by the decrease in the number of American tourists since 1929. Their passenger traffic has declined in the last few years whereas in the U. S. there has been a steady incrasee from year to year.

The British and the Germans are the only Europeans who utilize their air service to any extent. The French are probably the most backward. The official records at Le Bourget show that only about 3 per cent of the passengers in French planes are Frenchmen. And don't think that there are any Frenchmen riding on their competitors' planes.

Under these unfavorable conditions —difficulties of establishing long routes, no night flying, etc.—it is obvious that few European air transport companies have ever been able to come near covering their expenses out of commercial receipts. They all lean heavily on the government subsidy.

In France, for instance, 1929 was the best year they have ever had. The French company most nearly covering expenses in this year reported receipts equal to only 42 per cent of the subsidy. The average for the five French companies that year was 29 per cent of the subsidy. Imperial Airways of Great Britain has probably done better than any of the others, but the government subsidy has always constituted 50 per cent or more of its total income. For example, in 1929, Imperial Airways made a net profit of $390,000 (at par) but that includes a subsidy of $1,675,000!

This British company, by the way, is one of the best-managed and most interesting of the European lines. It came into existence in 1924 as an amalgamation, at the suggestion of the government, of the four companies which were then in the field, flying from London to Paris, Brussels, and Amsterdam. It has had a monopoly of all subsidies voted by the British Parliament up to 1939.

That is, since 1924 no other company has been eligible for a state subsidy, and since no company has been able to stay in business without it, there have been no successful competitors of Imperial Airways. The government has representation on the Board of Directors and enough influence to indirectly control the company's policies. Imperial Airways is *the* British air line and the people take a national pride in its undertakings.

The influence of the government has made itself felt in the type of planes used by the company. In 1926 the Government Air Ministry experts decided that the development of commercial planes should tend towards bigger and more powerful ships. They expressed the opinion that biplanes were the most satisfactory type. Since then, Imperial Airways has bought only biplanes with three or more motors; it has constantly increased the carrying capacity of its ships until today it operates the largest transport liners in Europe.

The government has also influenced the expansion of the company's routes. In 1927, Imperial Airways appealed to the government for an increase in subsidies, contending that certain of its European routes, where competition with the *SABENA* of Belgium and another European airline was keen, would have to be dropped.

The government replied that it might be wise to drop those routes and to turn more attention to the inauguration of long-distance services which would link up the far-flung parts of the British Empire. Here the British line would enjoy a distinct advantage with no competition and would serve a useful purpose in bringing parts of the Empire into closer touch

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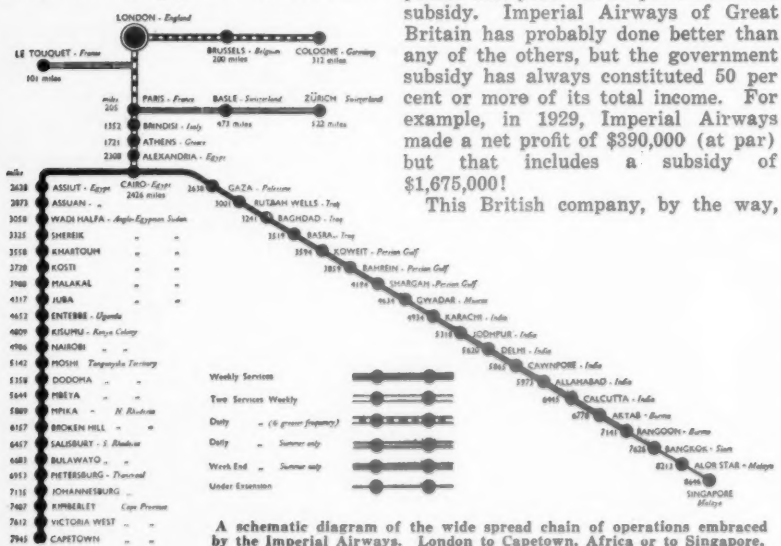

A schematic diagram of the wide spread chain of operations embraced by the Imperial Airways. London to Capetown, Africa or to Singapore, Malaya are the extreme termini.

Willie Coppens—Belgian Ace

by CARL B. OGILVIE

Of all the wartime "balloon busters," Willie Coppens was the outstanding hero. He devised a system of attack, followed it to the letter and—is still living, as the reward of his ingenious tactics.

APRIL 6, 1934, will mark the seventeenth anniversary of the United States government's declaration of war against the Imperial German government. We air-minded people naturally think of the World War in terms of aviation. For that struggle was, up until that time, the greatest single factor in the development of aviation since the Wrights flew at Kitty Hawk.

During the years of 1914 to 1918, when aviation lost its pin feathers and became a full-fledged fighting eagle, we recall many things that stood out in those days, heralded as great strides forward—the rotary air-cooled motor, the synchronized machine gun, air speed increased from 60 m.p.h. to the astonishing velocity of 135 m.p.h., of planes so strongly constructed they withstood power dives of over 200 m.p.h., of massed squadron bombing raids, of dog-fights and aerial duels to the death.

Our memory lingers longer on those daring, patriotic young men—men of the finest physique their country had to offer; men who flew in blood-stained battle skies in hurriedly flung together "crates" to fly and fight, win victories and die. It was not in vain. For to those gallant heroic birdmen must go the credit of having helped to put aviation a quarter of a century ahead in its then snail-like development.

"Shooting Down a Drachen," from the painting by the noted French wartime artist, Henri Farre'. This picture shows the hazardous nature of balloon busting—danger from the Archie shells, from enemy pursuit planes and machine gun fire.

When we think of famous World War Aces, we try to recollect their total number of victories and recollections of the gallant deeds of brave lads of the air services sweep across our memory. Flashing before our mind's eyes is a mighty squadron. Every man at the stick of those airplanes is a hero. And our beloved Captain "Eddie" Rickenbacker is leading that Squadron of Heroes. In number two position is Lieutenant Frank Luke, the "Balloon Buster."

Rickenbacker, our greatest Ace, shot down three balloons. Luke only got five enemy planes, but he became our greatest balloon buster with 13 victories accredited to him. That world-famous "madcap" fighter and destroyer of German observation balloons claimed he shot down many more.

Luke's record, unequalled by any American pilot, becomes all the more remarkable when we recall that an inestimable number of German pilots succeeded in shooting down only 15 American observation balloons. Luke—one man alone—missed by two only, of shooting down one Boche *drachen* for every American balloon shot down by the German Air Service.

Yet you may be surprised to learn, that despite his brilliant record, Frank Luke ranks fifth as a balloon buster. He was outranked by a Belgian, two German pilot-mechanics and a French lieutenant. Coppens of Belgium shot down 33 balloons; Boyan of France and Gonterman of Germany tied for second place with 24 balloons each and Buckler, also of the German Imperial Air Service, edged Luke out by one balloon, getting a total of 14.

Of these five greatest balloon busters, Luke was the only one killed in action. Gonterman was killed in an accident when a wing of his new ship came off. Boyan was shot down, wounded and taken prisoner. He, as well as all the others, was alive at the end of hostilities. Luke died, as every one knows, with a blazing automatic in his hand rather than to surrender when he was forced down behind the lines in German territory.

You may feel that it is not exactly fair to compare the total number of victories of America's leading balloon destroyer against that of Coppens, who saw longer service. True, Luke saw only nine days of flying duty. No one can possibly estimate how many balloons he might have shot down had he seen as many months of service as "Willie" Coppens. There are few that believe Luke would have lived that long.

The French shook their heads sadly and exclaimed: "A magnificent fighter, but so foolish. He will die the unfortunate death without delay." With this prophecy most airmen who knew the "madcap" Luke agreed. In this article, however, we are interested in the fighting technique of Willie Coppens, who shot down nine more balloons than any other war-time pilot. The mad, reckless fighting style of Frank Luke is too well known to repeat here.

How did Coppens run up such a remarkable record of brilliant victories? How was it possible for him to go defiantly on wings into the very jaws of death, scores and scores of times, to shoot down 33 of the most dangerous targets in the battle skies—and to return victorious and safely to his drome in Flanders?

Did I hear someone snicker at the word dangerous? You have read any number of times that balloon strafing was dangerous and you have been forced to accept the statement without proof or much explanation. "Sure they *say* it's dangerous," you growl to yourself. "But how can it be?" The balloon is a target as big as a firehouse; it usually hung around 2,000 to 3,000 feet— that's low altitude and it didn't take long to climb up to it in a warplane. Any pilot that couldn't hit a balloon with a machine gun was cockeyed in one eye and couldn't see out of the other . . . " And on you rave.

* * *

WELL, Buddy, I said the same thing and more. "Just a nice little lark, an aerial picnic and a lot of glory when you get back," I said, and had to eat those words and use prop wash for a gargle. But hop in this two-seater and we'll fly over Heinie's front line and see *how easy* and safe it is to get a "sausage."

The first thing that you notice is that I tell you to keep her nose up until you have climbed up to an altitude of over

5,000 feet. Sure, twice as high as the enemy balloon. Think I'm planning to have you make a long dive on the bag? You forget, my lad, the Heinie anti-aircraft gunners have a playful habit of clipping tail assemblies and ailerons just to give a pilot time to regret his past as he goes down out of control. As I hold my breath, expecting Archie, your feet are pumping the rudder-bar. Zigzagging the ship like an eel to make sure a special A. A. shrapnel won't give us a red light and pull us down to a stop.

Fifteen miles or so, back of the lines, you look overside. There's your first victim—a good 3,000 feet beneath you. I can tell by the grin on that handsome mug of yours that you're thinking it's going to be so easy that you should drop the balloon observer a note and say that you're coming down to see him sometime. Go down, sweet innocence, I'm praying for you and, incidently, myself.

You kick right rudder, nose down out of a tight spiral and with full open gun you go tearing down at him.

Ain't puncturing a sausage casing going to be grand fun?

Plop. Plop-plop!

Well—maybe it *ain't!*

The peaceful sky becomes bumpy and thunder roars in your startled eardrums. The heavens seem to be tossing mud up at your ship. Ah ha, my lad. Your old friend the A. A.'s are inviting you down for beer and pretzels. Sure thing, there are anti-aircraft guns planted all around that gas bag. Archie knows the exact altitude at which the balloon is tethered at the end of the cable. Above that he can tear your path to bits with shrapnel. You can't zigzag now. You got to sit tight and take it—if you want to get a balloon.

Down you keep on diving at a speed of better than 200 miles an hour. Things happen fast at this speed. Think fast. One mistake and it will be your last. I breathe easier and a grim sort of smile stretches across my pan. You're below the Archie fire now, and the crew at the winch are working madly to pull the bag down. It's going to be a cinch. . . . Pardon me for being green around the gills. I'm with you in the ship, but I don't share your optimism. Look . . . !

Flac—flac-flac . . .

Now you're getting it. The fabric on the wings is torn and tattered, begins to look like Mae West's gown after a party in a Bowery beer garden. Machine gun lead is hailing up at you so thick it would make a Rocky Mountain blizzard seem like sunny California in August. In case you're at all curious, you might glance overside. Just one little peek. Surprised? Just a friendly bunch of mighty busy gunners grouped around 30 machine guns. They sure are sending you messages of welcome—for a quick death—via the long burst code. Hi ho! ain't you got fun now and have I got the jitters or have I got . . . ?

You smile confidently while I mop cold sweat off my furrowed brow. Those machine guns are lined up so their bursts converge at your airplane and when you get down to a certain height you kiss the bullets of a withering cross fire. Listen, Buddy, I know you've read this Magazine and know all about building models and flying an airplane, but this isn't exactly a snow ball party. Pull the stick back . . . level off . . . show the Huns your tail. Valor, my eye! I'd like to live to write another article.

Hey, you're zooming! Going after that other sausage over to the west? Going west is right. Yes, I can see there are no Archie or machine guns protecting it. Say—that bag is a . . . !

But my trembling voice is carried away by the prop wash. And up you climb to send a long burst into that bag. And then . . .

Woof! Bang!

It happened so quickly you couldn't tell what it was all about. You're mighty busy for the next several minutes fighting to regain control of your ship. And you look back at me and you're twice as green as I am. And all I can do is pray—a tougher job for me than tackling a joystick.

Sure, that second *drachen* was a decoy. Filled with ammonal. It darned near gave us a pair of wings decorated with feathers instead of fabric.

Now we hear the drone of Mercedes motors. Look—a staffel of Huns! They are climbing up from an emergency field near by. Buddy, their job is to scare nosey pilots, like you, back home. And boy, your job is to get me there *pronto.*

Now you'll argue: "It's not such a difficult job to send a burst of explosive bullets into an observation balloon. The tough job is to get close enough to do it."

Buddy, you are wiser for you have seen the light.

A balloon strafer didn't fight a balloon. He fought Archies, machine gunners, decoy balloons and protecting squadrons before he got close enough to a "sausage" to smell it frying. It was a full recognition of these important factors that caused Willie Coppens to rise from the ranks of obscurity to become the world's greatest balloon strafer.

Coppens was an insignificant noncom when he started his career in a Belgian pursuit escadrille. He decided he must do something unusual and do it thoroughly if he was to win recognition as an airman worthy of serving his king. Perhaps German sausage

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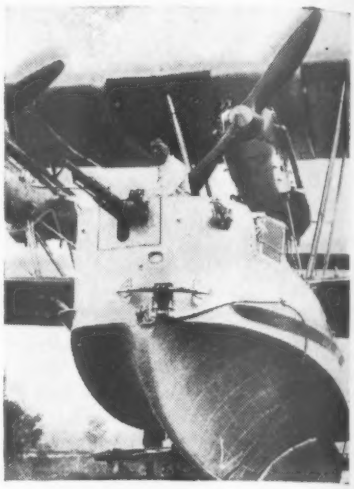
Britain Uses Big Guns



The gun is mounted in the prow of the boat.

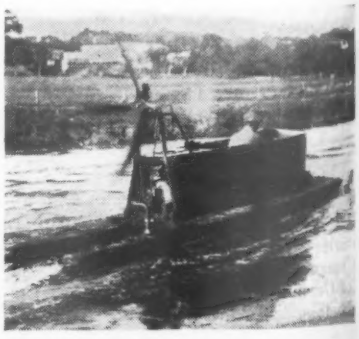
THE largest flying boat in the Royal Air Force was recently launched at the works of the Blackburn Aeroplane and Motor Company, Ltd., Brough, Yorkshire, England.

This plane is the first modern flying boat to carry a gun capable of firing shells, and the gun is shown mounted in the bow of the ship where the gunner has a large range of fire. The new gun shoots 1½ pound shells at the rate of 100 rounds per minute. In addition to the rifle is a machine gun and bomb racks.

Air Propelled Catamaran

AMONG the South Sea Islands, the double float catamaran is extensively used in place of the more usual type of boat. It has many advantages, among which is its great stability in rough water, great resistance to upsetting and extremely shallow draft.

And here we present the modern adaption of the old native theme, an English catamaran driven by an air-propeller with a little Austin 7 h.p. engine doing the work. It was developed by W. F. Davies, Dudley, England, and is shown on one of its successful trips on the upper Severn River. It has a draft of only three inches.



A high-speed shallow draft catamaran.

Death Stalks the Air Racers

by WILLIAM A. ONG

An instructive article by a well-known race-pilot who reviews the hazards and thrills experienced by the pylon polishers at the air races. It is an intensely interesting story by an authority on the subject.

AT SIX-THIRTY on the afternoon of September 4, 1933, the curtain came down upon a stage filled for four consecutive days with daredevil pilots, colorful personalities and hair-raising performances. The stage was Curtiss-Reynolds Airport, near Chicago and the show was the International Air Races, official aviation extravaganza of Chicago's Century of Progress.

For four thrill packed days, thousands of spectators had gaped skyward at the spectacle of Lieutenant Tito Falconi, Italian ace, nonchalantly flying upside down past the stands a scant hundred feet above the earth; at Spud Manning, a bashful quiet young fellow from Los Angeles, leaping from a plane at sixteen thousand feet and falling like a black meteor a full fifteen thousand feet before releasing his parachute. They shuddered as Frank Clark of Hollywood, fresh from movieland threw his white ship into a vicious power spin at six hundred feet, recovering just in time to nearly run his wheels on the ground as he zoomed upward.

Once or twice each year, an ever-changing little group of race pilots, chute jumpers and aerial acrobats gather to put on the show that inevitably takes its toll of human life. Chicago's last major aviation spectacle was the National Air Races held on the same airport in 1930. Less than half the competing pilots of that year faced the starters' flag on Labor Day, 1933. Oddly enough, the toll has been heaviest among the most prominent and skilled flyers.

Speed Holman, beloved pilot of the Northwest, crashed upside down at over two hundred miles an hour. Dale Jackson, co-holder of a world's endurance record and premier stunt pilot, was carried to his death in the crumpled wreckage of his plane, unable to extricate himself from the tangled mass to use his parachute. Lowell Bayles hurtled into the ground at nearly three hundred miles an hour as he set a new record for landplanes. Russell Boardman, who flew from New York to Turkey nonstop, was fatally injured taking off at Indianapolis during the Bendix Trophy Race on July 1st. So they go, cheerful iron-nerved fatalists, shooting the works to give the crowd a thrill.

* * *

NOW, back to Curtiss-Reynolds Airport on the afternoon of September 4. Fifty thousand thrill seekers had exchanged their pieces of silver for a seat in the crowded grandstands. Thrills they got, and plenty of them. Major Ernst Udet put their hearts in their mouths with a mad exhibition of crazy flying, miraculously missing the ground time after time. Spud Manning brought them right out of their seats with a fifteen thousand foot delayed parachute drop. Falconi, with the zest for showmanship characteristic of his race, spared neither himself nor his ship in an effort to show up Udet. The picked pilots of the Army and the Quantico Marines did their stuff in a frenzied bid for the favor of the crowd. Then came the final event of the four day show, and spectators sat back in their seats as the announcer called the feature of the program, the 100 mile Phillips Trophy Race, ten laps of a ten mile triangular course. Then James Rowan Ewing, acclaimed the best air race announcer on the air, threw a bombshell.

"—now we have a surprise for you. Florence Klingensmith of Minneapolis has just filed her entry in the Phillips Trophy Race. She is the only woman pilot ever to compete in a race of this importance, the fastest race in the world for landplanes. Florence, step up to the microphone and say 'hello' to the crowd."

* * *

LET'S pause a moment to look at Florence Klingensmith, who has so calmly walked into the very den of the hottest flying bunch of pilots kicking a rudder today. Twenty-six years old. A striking blonde, blue eyed, with a fair skin that no amount of scorching sun or biting dust seemed to mar. Unlike many woman pilots she retained all her attractive femininity. Even now, clad in light green jodphurs and brown Norfolk jacket with a saucy little beret to match her slim figure, she kept her girlish charm.

Florence could fly anything with wings on it and knew it. So did every woman pilot in the country; which may have been the reason she held a warmer spot in the hearts of men pilots, who respected her unusual ability. At a party or around a bridge table, the girls may have their catty moments. But on the flying field feminine rivalry is bitter indeed.

Florence paid little heed to comment, good or bad. In her supremely confident way she continued to fly everything she could find, smoothly, beautifully, perfectly. Now, as she stepped to the microphone, her white teeth flashed with that cocky little smile. "—so I'm going out to try to give the boys a race. I know it's a lot of competition and all that, but I'll tell you more about it after it's over!"

* * *

Seven racing airplanes, motors

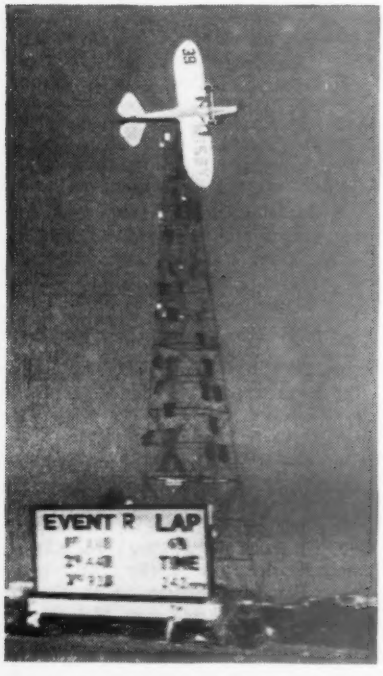
A Man is Judged by the Company He Keeps

idling, were on the line for a race horse start. Among them Jimmie Wedell, who an hour before had set a new world's speed record of 305 miles an hour, Roscoe Turner, holder of the East-West transcontinental record and the slim blonde from Minneapolis. Not smiling now, her goggled eyes glued to the flag in the upraised hand of the starter. The flag dropped, idling engines broke into an ear splitting roar, and the Phillips Trophy Race was on.

* * *

Florence was away to a fast start, but as the planes came down the home stretch ending the first lap, the superior speed of the Wedell and Turner entries gave evidence that, barring accident, one of the two, would win first place. However, an interesting struggle began with Miles, Minor, Gelbach, and Florence Klingensmith fighting fiercely for follow-up honors. The blonde girl pilot was giving her low-wing monoplane everything it had. A stream of black smoke trailed comet-like behind the ivory and scarlet fuselage. As the racing ships hurtled down the stretch the crowd came to its feet. Wedell in the lead, Turner right on his tail.

Both pilots took the turn nicely, allowing but little distance clearance as they rounded the steel pylon. A cheer came from the crowd,—then swelled to a roar of enthusiastic approval as Florence Klingensmith, rolling her bullet shaped racer vertically on its side, pulled the ship around the marker so closely it seemed her wing must actually brush the pylon! With that turn Florence Klingensmith stole the show from under the very eyes of some of the finest race pilots in the game. From then on, every man and woman in the stands was pulling for her to win and curt comments of admiration for this supreme exhibition of sheer nerve and flying ability came from the pilots.



Benny Howard's "Ike," piloted by William Ong (author, in the Thompson Trophy Race of 1932.

* * *

Sixty miles completed—forty yet to go. Captain James Haizlip, holder of the West-East transcontinental record, was smiling as he checked the stop watch in his hand. At his side, excitedly squeezing her famous husband's arm, was Mae Haizlip, the girl pilot who now holds the world's speed record for women. Her eyes were shining as she watched Florence Klingensmith, flying a beautiful race, go into one of those breath taking turns, ending the sixth lap.

And then, suddenly as a flash of lightning, came tragedy. As Florence came out of the turn the fabric covering on the right wing failed under the strain. Pulled away from the wing as swiftly as one would tear a sheet of paper from a pad. Bits of linen floated lazily earthward and a wave of despairing helplessness swept over the watching pilots on the ground. The ship did not instantly plunge to earth. Like a flash the girl pilot, so terribly alone in the doomed plane, turned the nose from the course and flashed across the field. No one will ever know the thoughts that filled her mind. The instant of indecision,—to attempt a jump at a perilously low altitude,—the realization that the ship might plunge into the massed thousands of parked automobiles bordering the airport.

Mae Haizlip buried her face on her husband's shoulder. Jim beat his clenched fist upon my back and shouted hoarsely, "Bail out—jump, Florence,—jump NOW!"

* * *

Those age long seconds; twenty, thirty,—and the ship, still travelling over two hundred miles an hour, abruptly began to lose altitude. It cleared the parked cars and then suddenly, without an instant's warning, the nose dropped like a plummet, and the plane plunged to earth. Then did a slim blonde girl join the ghostly squadron whose names and deeds have made high courage.

The crowd got its thrill, and another scar of bitterness was carved upon the hearts of those pilots who watched—and still will carry on in the most dangerous game there is. John Livingston, ace of American race pilots, crushed his cigarette savagely in his open palm and spoke abruptly. "Is there any sense to this at all? How long are we going to pay such a price,—and for what?"

The answer is simple and old as the ages. Natural progression. Glory. Publicity. The roar of the crowd. So long as we seek to outdo our competitor, the price will not come down. So long as the lust of conquest, the thirst to win, the hunger for acclaim beats in human hearts there will be no shortage of candidates for the sacrificial altars of Winged Mercury.

A Flying Sleeper Now in Operation

A stewardess telling bed-time stories on a Eastern Air Transport airliner.

A CURTISS-WRIGHT Condor of the Eastern Air Transport is the first airliner to be equipped with sleeping berths. At present, only two berths are installed, one upper and one lower, but there is room for eight which will be added at an early date.

The berths are 6 feet 5 inches in length, 2 feet 4 inches wide and equipped with a Red Cross Supreme mattress. Each berth is supplied with draw curtains, individual ventilators, reading lights, hostess call buttons, clothes hangers, clothing nets, sheets, blankets and pillows.

The first passengers carried as sleepers were Capt. Eddie Rickenbacker, America's ace-of-aces and Alexander Strong, a consulting engineer of Boston. In our illustration, Miss Frances Lamkin, Atlanta, Ga., is listening joyfully to the hostess, Miss Elizabeth Hudson, before closing the curtain and turning out the lights.

Goodby — Tub

TAKING a bath is seven times more dangerous than flying an airplane. That's the deduction of the statisticians with the Metropolitan Life Insurance company. It shows that simple hazards of the home account for many more injuries each year than does riding in or piloting airplanes.

"Say, I wish that these Trans-Atlantic fliers would find some other ocean to fly over, I can't get a wink of sleep while this goes on."

Pioneer Days on the Coast

by WILLIS L. NYE

The author hails back to the time when Beachey, Art Smith and Silas Christofferson thrilled the spectators on the Pacific Coast with their wild flying during the Panama-Pacific International Exhibition.

AVIATION has progressed at a very rapid rate. Consequently, the name of a prominent figure in the development will flare up before the public eye, only to fade away as rapidly.

Pilots before the "Lindbergh Era" in aviation are unknown to many readers, so in the following memoirs I will recount some details of the exploits by a few men who were active many years ago on the west coast.

It has been the writer's good fortune to be in a position to have a rather close contact with the characters hereinafter introduced—in the role of a silent spectator. The memory of those early flyers has been indelibly marked on his mind.

The familiar Curtiss model JN4D or "Jenny" of war time training days and post-war barnstorming would have been very far advanced in a comparison with the planes that Beachey, Christofferson, Boquelle, Art Smith and others of the early days flew. The favorite craft of these days was a biplane—pusher style—with ailerons between the wings. The tail-surfaces were carried on outriggers and the pilot sat on the leading edge of the front wing with the motor directly behind him.

Probably, the one individual of the group that contributed most to the commercial end of the business on the West Coast was Silas Christofferson. Of his early life little is known. His early exploits around the San Francisco Bay region attracted considerable public attention and he engaged in a considerable amount of cross-country flying, little of which was being done in those early times.

His trips in the air carried him up and down the Pacific Coast very nearly over the same routes as now traversed by the Varney Speed Lines, the Pacific Air Transport and other West Coast air operations.

Possibly the greatest event Christofferson undertook was his determined attempt to fly from Los Angeles to San Francisco. The route chosen was over the Tehatchepi Pass near Bakersfield, inland in Southern California, noted for its treacherous flying weather and rough terrain. The ship was an orthodox pusher biplane with a fifty horsepower motor. After several times being forced to return from the starting place, flight was finally achieved.

The late Lincoln Beachey, the greatest stunt flyer of all time who possessed almost superhuman skill. A wonderful pilot and a born showman.

Most all of the early aircraft possessed qualities of poor performance largely because they were underpowered. They yawed badly, taxied erratically, were slow in climb and highly unstable. Cross-country flying in equipment of this sort was naturally fraught with danger as compared to our modern airplanes. Christofferson did a large amount of flying around the San Francisco Bay with floats to replace the landing gear on the pusher biplane with comparatively few forced landings. He did not experience a crackup which testifies to his keen ability at piloting.

While being no stunt artist, using sound judgment, he flew when conditions were safe for air travel. He carried many passengers without injury and was one of the first individuals to start an airline. Flights from the north shore of San Francisco over to Sausilito across the bay were made using a boat type of seaplane.

These early planes did not afford the degree of luxury now common in air transport for the passengers were forced to stand up behind the pilot, strapped in place with a life-jacket around them directly exposed to the air-stream. The whole idea was far from practical and the airline failed due to lack of patronage.

After the failure of the air-route, Christofferson turned to the Panama Pacific International Exposition on the north shore of San Francisco, near the Presidio, and engaged in exhibition flying on Sundays. These flights were in the nature of publicity stunts prior to the opening of the great exposition. Among the company of early pilots there were Roy Francis and Robert Fowler. Both land and seaplanes were used in these exhibitions.

With his brother, Harry Christofferson, he established an airplane factory on what is now "automobile row" on Van Ness Avenue in San Francisco.

After the great exposition had closed, the brothers then established a flying school and airplane factory at Redwood City, thirty miles south of San Francisco. Several ships were built there and students were trained. It was while test flying a new biplane that Silas Christofferson met his death from an undetermined cause.

Lincoln Beachey was the exponent of the gentle art of "looping the loop," possibly a phrase which was a hangover from some similar circus stunt. This pilot was one of the assemblage of stars that the Exposition officials had gathered to entertain the crowds prior to the opening of the fair grounds.

Beachey flew a baby Curtiss pusher biplane with a Gnome rotary air-cooled motor. The performance was good for a ship of its class and his stunt flying was daring as well as precise. A favorite trick of his was to hedge-hop with his hands off the controls, much to the gasping amusement of the spectators.

The landing field that most of these pilots used was a narrow short strip of land now known as the Marina. Due to obstructions then erected, it required excellent technique to land safely for the wind

Lincoln Beachey taking off in his experimental monoplane.

was generally at an angle to the line of flight.

Perhaps Lincoln Beachey then sounded the death knell of the battleship. His idea was to ballyhoo, on the billboards, the destruction of a warship. The stunt was to anchor a barge off the bay shore, about half a mile out, with a false framework erected to simulate a battleship. Beachey would do the "hell diving," dropping white sandbags on the barge, while fireworks would be detonated simultaneously to resemble direct hits causing explosions and demolishing the false staging. It was quite amusing and perhaps even annoying to naval officers stationed on the old U. S. S. Oregon then anchored offshore in view of the whole performance.

An attempt was made by Beachey to break the Pacific Coast Altitude record during this period. Being within twenty feet of the plane at this time while it was being groomed and warmed up, flames suddenly flared up on the trailing edge, directly back of the power plant. Beachey was engaged in donning heavy flying clothing, and when he noticed the flames breaking out he coolly stepped into the seat, revved up the motor and extinguished the flames by the force of the slip-stream.

Immediately, he taxied into the wind and took off, minus three feet of wing surface. This instilled into that mob of spectators an idea of the coolness and fearlessness of his character. He did not reach the required altitude on this flight to break the existing record.

In concluding an aerial stunt exhibition it was customary for Beachey to nosedive, then side-slip, and make a perfect three wheel landing. The landing part of the stunt was not as easy as it is today because the gear had no system of shock absorbers. The ground was rough and the ship could not be "stalled-in" but had to be flown in and leveled off very close to the ground. A slight inaccuracy in the landing operation would be serious to the pilot because he was exposed and right over the gear members.

The small biplane was cracked up badly while Beachey attempted a flight inside the Machinery Hall at the Exposition. This was another publicity stunt to emphasize the magnitude of the building for it was the largest structure in the world at that time—supposedly. The ship was wheeled down to one end of the building and tied down. The motor was revved wide-open and the ties released. The plane took off after a short run, rose and pancaked to a hard landing, finally crashing into the end of the building but not injuring the pilot. However, the ship actually left the floor of the building and flew inside the structure.

Another whim of Beachey's was to lash an automatic motion picture camera to the outboard wing struts and take pictures of himself while stunting the ship. This was interesting when shown on the screen. Newspaper men continually made pictures of him looping in mid-air from accompanying

The boyish Art Smith, a famous stunt pilot in the early days.

planes, and Beachey was the public's idol until his tragic death.

In a desire to have a plane that would perform better, and with an idea to speed, Lincoln Beachey designed and built himself a monoplane patterned after the "Taube" design. This machine, while more powerful and capable of better performance, was structurally unsafe for violent acrobatic maneuvers and consequently failed during a power-dive to earth. The wing structure gave away and the wreckage fell into the water between two transport docks adjacent to the flying field. This fatal crash carried the newspaper front pages for two days and sidetracked current war news.

Beachey's crash ended stunt flying at the fair grounds. Finally, Art Smith was awarded a contract to give exhibition flights daily involving night flying, but his first night flight and public appearance ended nearly in a disaster. He intended to fly with the roman candle type of flares attached to the trailing edges of the wings of his pusher biplane. They were ignited by electricity, but through some error, giant firecrackers were used in place of the roman candles, and when they were touched off, they began to blow pieces of the wings up in the air. Smith perceived the danger and landed with his clothing afire and the wings nearly burnt off.

Art Smith flew a pusher biplane powered with one of the early models of the OX4 Curtiss water-cooled motor. The ship had a fair performance and was built better than most planes of that class for the time. This young pilot handled the plane very precisely, suffered no crackups, had few forced landings, and had a high regard to safety. He once ground-looped his ship purposely, dishing a wing tip, to avoid hitting the crowds after a thrilling flight.

(*Concluded on page* 197)

This is a Valuable Book

THE present bulletin on "Airworthiness Requirements" tells you everything you need to know in order to get your ship approved—providing that you can understand it! It is not difficult for an engineer to follow, but its use involves considerable mathematics and it presupposes, on the part of the reader, a complete engineering education and the ability to make a satisfactory stress analysis.

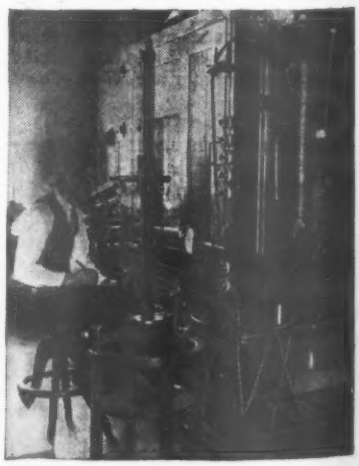
This is a fine little handbook, and has no doubt consumed many a pint of midnight oil during its preparation. Each year it gets a little bigger and a little more explicit, i. e. from an engineer's point of view it gets better, but to the layman more confusing. This is a step in the right direction for the wholesale manufacturer, but it doesn't ease the burden of the amateur any.

Rumor has it that the Aeronautics Branch has to fight like wild hosses to get any money for any purpose whatsoever, and for that reason it might be a dog's age before we can expect anything along the line of a "Ham's Handbook" to be distributed free by our old Uncle Sam.

Checking Up on the Barograph Readings

TO INSURE accuracy on all points concerned with Lieut. Commander Settle's recent flight into the stratosphere, the barograph (height indicator) was carefully tested and checked at the U. S. Bureau of Standards, Washington, D. C.

A barograph does not directly measure the altitude in feet with the precision of a foot-rule, but many corrections must be made before the indications present the necessary degree of accuracy. Frictional errors, hysteresis, moisture content of the air, temperature and many other factors must be considered before the final results are accepted.



Determining the temperature error of Settle's barograph.

Are Physical Tests of Value?

by H. LATANE LEWIS II

Arbitrarily selected physical requirements are barring thousands of men from flying—men who really would make fine pilots if it were not for the doctor's "N. G." on their student application. The author cites interesting facts on the disability regulations now in force and in force during the war.

THE IMPORTANCE of physical fitness for pilots has been greatly exaggerated. Of course, in flying perfect health is an asset, just as it is in any other profession, but no more so.

Physical culture enthusiasts and flight surgeons would have us believe that aviation is a game for only supermen and unfortunately a false impression has been created. Undoubtedly, there are a great many people who would like to learn to fly but have been discouraged because they believe that they do not possess the necessary physical qualifications.

Some of the outstanding pilots in the history of aviation have been physically defective. Guynemer, the sensational French ace, was dying of tuberculosis; Boelke, the great German airman, suffered from acute asthma; Zeumer, the German ace who flew with Richthofen, was a consumptive invalid while still an active fighting pilot; Wiley Post, of the world-girdling team of Post and Gatty, has the use of only eye; and so it goes.

Aviation medicine, which deals with the physical and mental condition of pilots, came into being during the World War. Thousands of young men were anxious to get into the Air Service and it was necessary to devise some method of weeding out the undesirables. So the physicians and psychologists put their heads together and created a series of tests which were supposed to determine whether or not a prospective student could learn to fly.

At Issoudun, the training center in France, the system was tested out on veteran pilots just back from the front. The results are described as follows by Elliott White Springs, famous American ace, in his book, "Above the Bright Blue Sky."

". . . At Issoudun, all the best pilots back from the front got sick when they were whirled around in the torture chair and one fellow jumped through the window when the pistol went off behind him. They found one pilot who was practically blind, he was so nearsighted, and they were about to recommend him for a disability discharge when they found out that he had seven Huns to his credit and was the guy who used to lead all the long reconnaissance patrols. They say that one doctor wept for weeks after he found out that Mannock had a glass eye, Carlin a wooden leg and Guynemer was a hopeless invalid. The best score that was made in the tests was credited to a pilot that had crashed every machine he had ever flown and who later died of heart failure."

Department of Commerce statistics reveal that 11.9 per cent of all licensed pilots and 15.9 per cent of qualified students are physically defective. Seven per cent of transport pilots have physical defects which necessitate waiver.

An analysis of fatal accidents, involving physically normal and physically defective transport pilots, shows that 12.5 per cent of all accidents involving physically *normal* transport pilots have been fatal, while only 11.7 per cent of crashes with *defective* pilots have resulted in death. Thus, the physically sub-normal group is shown to have an even higher efficiency than the normal group.

Flying a pursuit ship is a job requiring the utmost in mental and physical ability, but how many civilians will ever attempt flying this sort of plane? Why burden the civilian with military physical requirements?

One point that has been greatly stressed is the necessity for perfect eyesight. This is really not a prime requisite for there is no reason why a pilot should not wear correcting glasses. The Department of Commerce recognizes this fact and permits such correcting lenses to be worn by pilots in the student and private grades.

The chief objection in the past has been the danger of goggles being blown off in flight, but this hazard has been removed by better cowling which diverts the blast of air. As an added precaution, an extra pair of goggles may be carried. Cabin planes, which are the decided trend in modern design, do not require the wearing of any special togs and ordinary spectacles may be worn.

The Department of Commerce will not disqualify a pilot if his vision is as poor as 20/50 in each eye, provided his correcting glasses bring the visual acuity up to 20/30. This means that, at a distance of 20 feet from the vision test letters, a person can read what an individual with normal eyesight should be able to read at 30 feet.

Much importance has been placed upon an "inherent sense of balance." It has long been thought that it is this sense of balance that enables a pilot to maintain control over his plane. Glider pilots, particularly, are prone to boast about "flying by the seat of their pants." Candidates undergoing physical examinations have frequently been spun around in abnormal positions to test their equilibrium.

Lieut.-Colonel Levy M. Hathaway, a well-known flight surgeon, has this to say concerning the human sense of balance: "When the earth is obscured by clouds and the horizon invisible, the airman cannot depend upon any inherent sense of equilibrium nor of direction. He is inadequate in this respect. We know that vision is the principal factor in maintaining or regaining equilibrium while flying. No man can fly blindfolded for any length of time. There must be visual contact with the horizon either directly or through the aid of instruments. It is necessary to depend upon instruments while flying through fogs, clouds, and dense rain or snow or in darkness sufficiently great to obscure the horizon.

Colonel Hathaway says that it is impossible to state definitely at the present time what types of men make the best flyers. "The only safe and sure method of assessing individual aptitude is by actual trial," he states.

The tendency seems to be for physical standards for pilots to become less and less stringent. Eyesight requirements have recently been made less exacting by the Department of Commerce. Other diseases which were formerly considered disqualifying, such as hay fever, no longer bar an applicant from securing a license. In fact, some of these diseases are found to be actually benefited by flying.

The San Franciso-Hawaii Flight

SIX U. S. Navy planes, carrying 30 men, established a world's record for an over-water formation flight on the recent cruise from San Francisco to Hawaii.

In spite of adverse weather conditions, the flight was without casualties and even without particular incident. This flight exceeded, in length, the flight made by Balbo's Italian Squadron.

The six officers in command of the planes during the San Francisco to Hawaii flight. Lieut. Commander Knefler McGinnis, in charge of the cruise stands at the extreme left.

SIX U. S. Navy planes, flying in formation, made the longest mass flight over water in the history of aviation. They flew from San Francisco to Honolulu, T. H., a distance of 2,396 statute miles in 24 hours, 45 minutes.

The flight was led by Lieut. Commander Knefler McGinnis, assisted by T. P. Wilkinson and Radio Operator G. C. Eddy. They flew blind for practically the entire 2,396 miles for they ran into fog and hazy weather shortly after they left San Francisco and, of course, the fact that they were flying against the prevailing west wind cut down their speed very materially.

For safety, six guard ships were posted along the route and the planes were all sighted from the ships but No. 5 which was slightly off its course so that it could not be seen by the ships Breeze and Whippoorwill. However, the commander of No. 5, Lieut. St. John Perry, said that he knew his position at all times and had no difficulty in rejoining the squadron.

It is interesting to note that the planes flown on this cruise, with the exception of one plane, previously broke a record by flying from Norfolk, Va., to Colo Solo, Panama, a distance of 1,788 nautical miles. This flight eclipsed the 1,618 nautical mile flight of the Italian armada's flight to Brazil in 1931. From Panama, the planes were flown to San Diego, Calif., then to San Francisco, before proceeding on the trip to Honolulu.

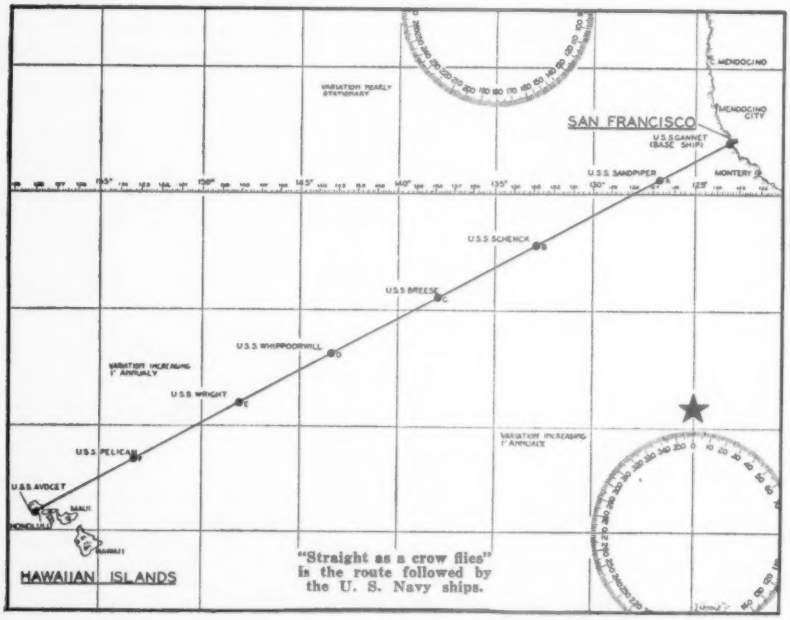
After its arrival in Honolulu, the formation circled the John Rodgers territorial airport, named in Honor of Commander John Rodgers who was lost on the Navy's first flight to Hawaii, nine years ago. In 1925, Commander Rodgers and four men were forced down off the coast of Kauai, falling short of their goal by 450 miles. The plane was picked up nine days later by a torpedo boat.

The gasoline supply was more than ample, even though the flight was made against the prevailing wind. At the completion of the trip, Lieut. Commander McGinnis said that sufficient gasoline remained in the tanks to continue on for at least 1,250 miles farther had it been necessary.

The Navy stationed six vessels spaced at equal distances along the route. These were the Sandpiper, Schenk, Breeze, Whippoorwill, Wright and Pelican. A base ship, the Gannet was stationed at the San Francisco end while the U. S. S. Avocet scouted the Hawaiian shores. This rather suggests the possibility of stations for aerial commercial service by the establishment of service "islands" along a given commercial airway.

It also demonstrates the possibility of delivering warplanes and men to the Hawaiian Islands in case of trouble at the latter point, it being possible to ferry the bombers and long range planes by the method indicated by this adventure.

To steer the planes accurately across such a stretch of watery waste, and to exactly strike the little dots of islands lying in the wide expanse of ocean, is a tribute to the development of modern navigational instruments and methods. In a distance of 2,396 miles, the slightest angular deviation would be sufficient to throw the planes a considerable distance off their course.



"Straight as a crow flies" is the route followed by the U. S. Navy ships.

Radio Method of Blind Landing

by T-2003

A detailed explanation of the new method by which the U. S. Army Air Corps makes blind landings possible by radio wave control. Thus, safety to planes is insured even in the densest fogs.

EARLY one morning in May, 1932, at the Army's test flight grounds near Dayton, Ohio, a small group of officers and civilian technicians from Wright Field gathered about a basic training plane which, although a two-seater, had nothing more than a sandbag in the rear cockpit.

Forward, in the pilot's seat, a chunky compact figure sat and grinned as he looked about him. The engine was "tocking" over idly and a gentle west wind blew over the hill to one side of Patterson Field.

Without further ado, the pilot reached back and pulled a canvas "canteloupe" hood over his head, a hood that shut off all view of the outside world to him, leaving visible only the airplane's lighted instrument board.

"Good luck, Hegey," a fellow pilot shouted earnestly, for Captain Albert F. Hegenberger, who in 1927 had first flown the United States-Hawaii passage with Maitland, was now about to make another premier flight, this time entirely solo.

The propeller leaped to life, the plane dragged forward and its speed increased. Its tail lifted until the fuselage was level, then the plane, guided by the pilot whose actions at the controls were guided in turn by the instruments before him, rose from the ground and flew on into the West wind. The little group of fellow scientists breathed with relief, then settled down to their jobs at various radio devices, or just watched and waited.

For ten minutes the Army pilot flew in the vicinity of the city of Springfield after having made an easy turn in that direction. He had no view of Ohio's horizon, but an artifical one on his instrument board told him when he was banked, or flying level or nose up or nose down. Soon, over the radio receivers on the ground, came the laconic words, "I'm coming in."

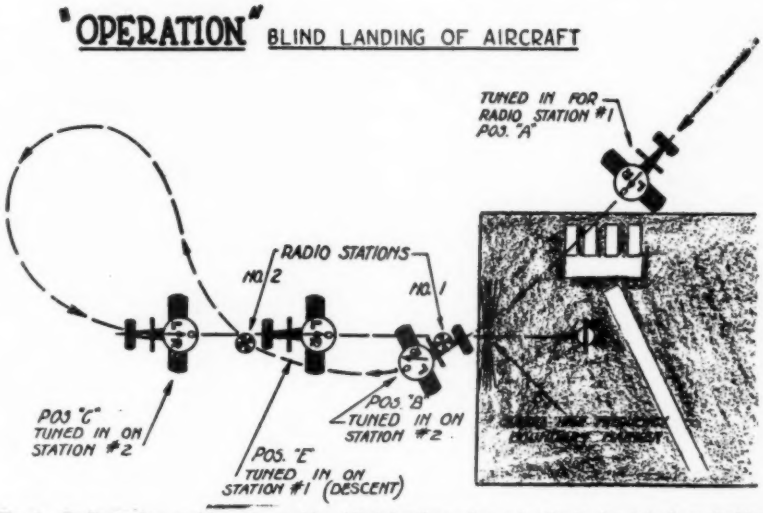

"OPERATION" BLIND LANDING OF AIRCRAFT
TUNED IN FOR RADIO STATION #1 POS. "A"
RADIO STATIONS
NO. 2
NO. 1
POS. "C" TUNED IN ON STATION #2
POS. "E" TUNED IN ON STATION #1 (DESCENT)
POS. "B" TUNED IN ON STATION #2

Fig. 1. Radio tuning positions for making blind landings shown in the horizontal plane, looking down upon the field.

THE airplane came into view, this time to leeward of the field and headed into the wind. From a height of 1,000 feet it floated in, nose up a bit, but power half on, to give it a few more miles per hour than its landing speed. The hood could be seen tightly closed over the pilot, but his instruments gave him sufficient knowledge of where his airplane was at each instant. The plane floated in closer to earth and to the center of the landing runway, then the wheels touched and, with a short roll, the plane came to rest.

The first *blind solo* flight had been made!

It was three years before this, that Jimmie Doolittle at Mitchel Field, New York, had made the first complete blind flight, take-off, flight and landing on record; carrying with him, however a safety pilot or look-out in the rear seat. Doolittle had demonstrated that it could be done.

In the meantime, Captain Hegenberger, in charge of instrument development in the Equipment Branch at Wright Field, continued working to devise a simple system of ground installation applicable to military use, as well as to perfect the instruments in the airplane to make blind flying as simple a procedure as ordinary flying. The airplane installation gave little trouble, but on the ground it presented a problem peculiar to the Army Air Corps.

The primary interest of this branch of the armed forces is in the military phases of aviation and a ground installation for blind take-off and landings which might be applicable to commercial aviation might not be practicable for military air operations. That is, a commercial layout could be a permanent one, but the Air Corps needed a completely portable apparatus, as it is not expected that permanent airdromes

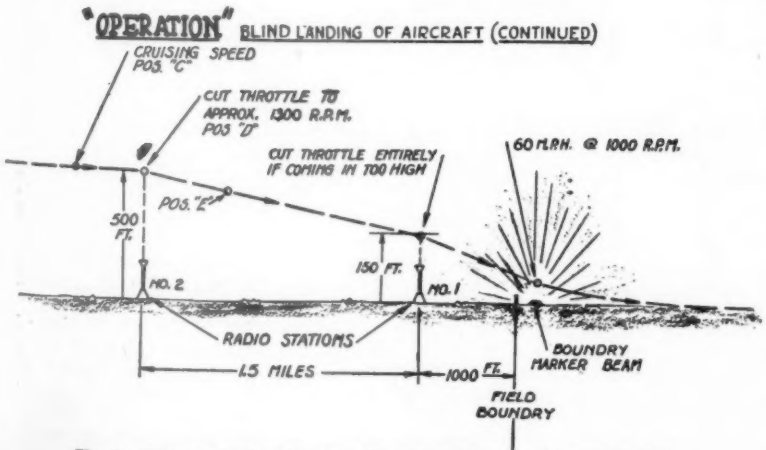


Fig. 2. Making a landing by the radio method shown in the vertical plane.

would be available for Uncle Sam's air forces in the theater of operations in time of war.

With the apparatus now in use by the Air Corps it will be perfectly possible for a group commander, who has selected a landing field for each of his squadrons, to send a transport plane carrying a complete set of such apparatus into each of the squadron fields. These fields could then be flown in all kinds of fog. In fact, it might even be advantageous to select an area for such fields where fog is prevalent if possible, as such fog would not prevent our own air forces from using such fields but would blanket them from the inquiring eyes of the enemy air force observation crews.

THE necessity for blind flight is a real one and such flights are not mere stunts, but are an indication that the same flying can be done in foggy weather, which shuts out all view of the outside world to the pilot as effectively as does his hooded cockpit when he practices these blind flights.

Straight blind, fog flying, or instrument flying, to call it by its various names, is part of the routine training of both student and finished pilots in the Army, as it is in the flying services of other countries. So many hours each year must be spent at a safe altitude in the air at the controls and beneath the closed hood, sometimes even on extended flights. A bored fellow pilot in the observer's cockpit just sits there and checks up.

This flying training is really easier than the camera obscura practice of the bombardment flyers, or that of hooking up message bags from the ground as practiced by the boys in the observation squadrons. The air mail pilots go through hours and hours of such blind flying in the course of a month; not as a matter of practice with a hooded cockpit, but through real fog or "soup," as part of their day's or night's work.

"After a week or so of sloppy weather you can't bear a steamy shower bath nor even a light grey suit of clothes," remarked a well-known air mail pilot to the author; "it reminds you too much of the old 'soup'."

In blind flying practice, if the pilot runs into a cloud stratum, he can lift the hood and still get credit for blind flying practice. The situations are identical except for the lookout in the observer's cockpit. In the 19th Bombardment Group at Rockwell Field, San Diego, California, Captain W. T. Larson generally acts as "chaperon" for the routine blind aviation flights scheduled for all the pilots in the group.

On one such flight, a dense fog was encountered between Rockwell Field and March Field, their destination. The pilot under the closed hood, oblivious to the weather, pushed on serenely. Larson, however, admits having been torn between nervousness and confidence in the instruction he'd already given the pilot. At the scheduled time, the hangar line at March Field was suddenly visible, although dimly, right below the plane.

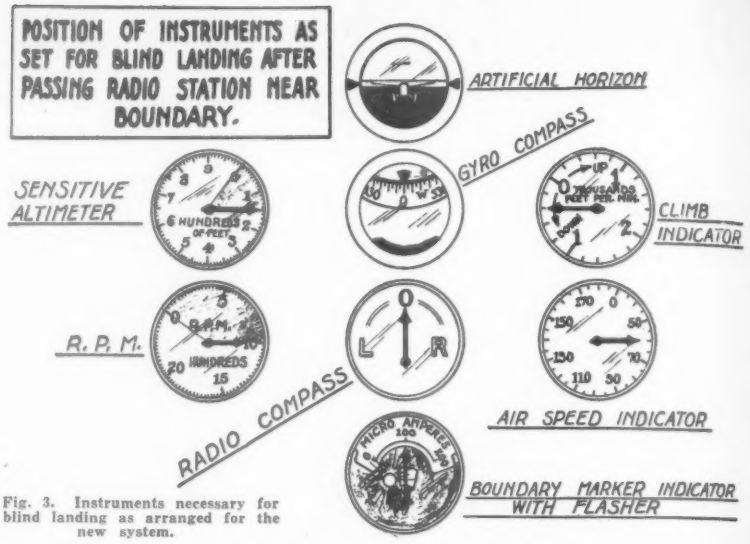


Fig. 3. Instruments necessary for blind landing as arranged for the new system.

TAKING off in the fog and getting to that "safe altitude" and climbing down out of it back to the ground completes the cycle and definitely licks the weather. Except maybe for ice, which is still unlicked. Perhaps one or more of the devices now being developed to prevent ice in a freezing mist from forming on wings and struts will do the trick and prove practicable. That may be next Winter, or that following.

As this is being written, my friend and host Lieutenant Bill McKiernan, the regular Army Air Corps instructor of the New Jersey National Guard Squadron at Newark, interrupts me to describe the complete blind cross country flight made several months ago by James L. Kinney. This Department of Commerce pilot took off from College Park, near Washington, D. C., in a dense fog, flew the 200 miles to Newark through "the soup" and landed at Newark in but slightly better weather with the aid of a buried cable installation under the airport.

As far as military flying is concerned, it means that if the objective on the ground is visible from the air and can be found, fog will not prevent an airplane nor a fleet of them, from getting there and returning to their base. In fog they are safe from attack from enemy's pursuit aviation and from his anti-aircraft artillery. In fact, one of the tricks of the trade in long range air reconnaissance into enemy territory is flying there and back through any available layer of clouds —and the thicker the safer.

Indeed, foggy mornings around Dayton invariably see Captain Hegenberger leave his office at Wright Field, motor to Patterson Field adjacent to the experimental station and there make his flights, solo or accompanied by another pilot or technician. Sometimes the weather is so thick that the plane often disappears from the sight of those at the hangar line before it has left the ground.

THE Air Corps Materiel Division at Wright Field has been working for the past four years on a number of systems, three of which gave promise of being the final solution, but only one has proven practicable for actual use in military aviation.

"As an example," to quote Major C. W. Howard, Chief engineer at Wright Field, in a recent report to the Chief of the Air Corps, "a system of underground cables developed by the French, marked the boundary of the landing field both in horizontal and vertical dimensions and was tried out on a small scale installation. It was found that not only the special equipment required for installation in the airplane was too heavy, but that the adoption of a cable system for emergency airdromes in war times would be of questionable use in view of the difficulties in transporting and installing cables.

"Another system utilized the airways radio beacon to guide the pilot to the airdrome and a portable direction beacon to show the direction for landing, together with instruments that had been developed primarily for avigation. The aim in these developments was to utilize instruments for installation in the airplane that could also be used for flight aids under normal conditions. The ground installations must be portable, light, and simple to set up, install and operate.

"This had led to the substitution of the radio compass and two small radio transmitters for the airways and portable directional beacons. This latter principle was demonstrated to be practical. The apparatus installed in the

(*Continued on page* 192)

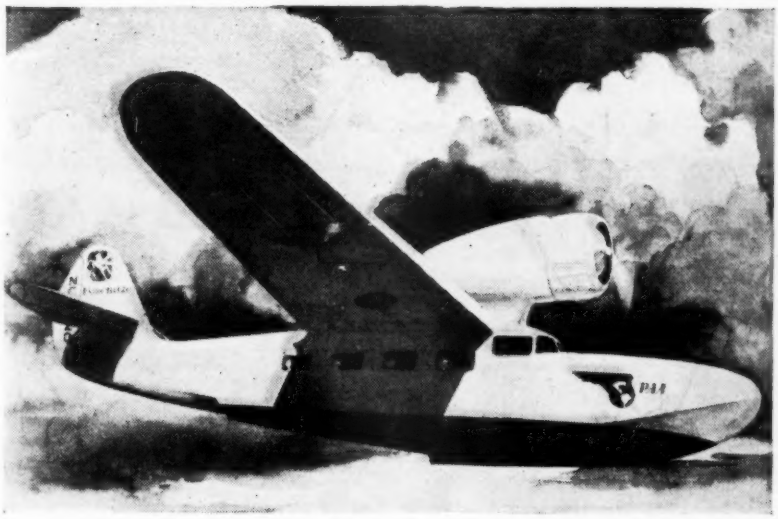
Prof. Piccard Discusses Speed

THREE factors are necessary for the economic success of air transportation, according to Prof. Auguste Piccard in his talk before the members of the *Institute of the Aeronautical Sciences*. These factors are: safety, cost and speed. The last item demands the most careful consideration and is the most important.

At sea-level, the higher the speed the greater will be the power required. Under present conditions, the fuel consumption for long distances is enormous at any near approach to the optimum velocity. According to the noted explorer of the stratosphere, a greater opportunity lies in the upper reaches of the atmosphere commonly known as the "stratosphere," where at an altitude of about ten miles the air is only one-tenth as dense as at sea-level and therefore, speeds three times as high can be obtained with the same power as at sea-level.

Dr. Piccard estimated that the maximum speed at an altitude of ten miles, or in the stratosphere, would be approximately 720 kilometers per hour or 448 miles per hour. This conclusion was arrived at from the relationship of propeller tip speed to the velocity of sound. However, such a plane would require special aerodynamic features since a plane capable of a speed of 448 m.p.h. on the ground would not be capable of reaching the stratosphere.

Pan American Airways Buys New Ships



This is an artist's sketch of the new Fairchild amphibians ordered by Pan American Airways.

PAN AMERICAN AIRWAYS has ordered six new Fairchild Amphibians of the type shown above, an order which will give employment to 100 men for over one year at the Fairchild plant.

The new ships will carry eight passengers and two pilots at a cruising speed of 180 m.p.h. They have been so designed that they can land without wheels with safety.

These new amphibians follow the style originated by Dornier which is gaining popularity in both the United States and Europe. And after all, the elevated engine arrangement is the logical location in many respects.

VELOCITY CONVERSIONS—TAB-V-22

(1) M.P.H.	(2) (M.P.H.)²	(3) $\sqrt{M.P.H.}$	(4) FEET/MIN	(5) FEET/SEC	(6) KILOM/HOUR
71	5041	8.4261	6248	104.1333	114.239
72	5184	8.4853	6336	105.6000	115.848
73	5329	8.5440	6424	107.0666	117.457
74	5476	8.6023	6512	108.5333	119.066
75	5625	8.6603	6600	110.0000	120.675
76	5776	8.7178	6688	111.4666	122.284
77	5929	8.7750	6776	112.9333	123.893
78	6084	8.8318	6864	114.4000	125.502
79	6241	8.8882	6952	115.8666	127.111
80	6400	8.9443	7040	117.3333	128.720
81	6561	9.0000	7128	118.6000	130.329
82	6724	9.0544	7216	120.2666	131.938
83	6889	9.1104	7304	121.7333	133.547
84	7056	9.1652	7392	123.2000	135.156
85	7225	9.2195	7480	124.6666	136.765
86	7396	9.2736	7568	126.1333	138.374
87	7569	9.3274	7656	127.6000	139.983
88	7744	9.3804	7744	129.0666	141.592
89	7921	9.4340	7832	130.5333	143.201
90	8100	9.4868	7920	132.0000	144.810
91	8281	9.5394	8008	133.4666	146.419
92	8464	9.5917	8096	134.9333	148.028
93	8649	9.6437	8184	136.4000	149.637
94	8836	9.6954	8272	137.8666	151.246
95	9025	9.7468	8360	139.3333	152.855
96	9216	9.7980	8448	140.8000	154.464
97	9409	9.8489	8536	142.2666	156.073
98	9604	9.8995	8624	143.7333	157.682
99	9801	9.9499	8712	145.2000	159.291
100	10000	10.0000	8800	146.6666	160.900
101	10201	10.0499	8888	148.1333	162.509
102	10404	10.0995	8976	149.6000	164.118
103	10609	10.1489	9064	151.0666	165.727
104	10816	10.1980	9152	152.5333	167.336
105	11025	10.2470	9240	154.0000	168.945

GLOSSARY OF WORDS, TERMS AND PHRASES — DIC-A-7

Afflux. Outward flow of air or a liquid.

Affluxion. Inward flow of air or a liquid.

Aft. Toward the rear or stern of a craft.

After. Located in the rear or stern of a craft.

Aftercockpit. The rear cockpit or compartment in an airplane.

Afterglow. A glow seen in the west after sunset. .

Afterwash. The disturbed air or turbulence in the rear of a body moving through the air. See WAKE preferred.

Age. To permit internal readjustments to take place within metals after machining, casting or forging, by prolonged storage of the metal.

Agonic Line. A line (isogonic line) connecting points where the earth's magnetic variation is zero.

A. I. A. S. (abbrev.) American Institute of the Aeronautical Sciences.

Ailerons. Hinged flaps employed for controlling the lateral (sidewise) balance or roll of an airplane by varying the lift at opposite ends of the wings.

Ailerons (Balanced). Ailerons arranged so that the air pressure is balanced about the hinges, hence a minimum effort is required for moving them.

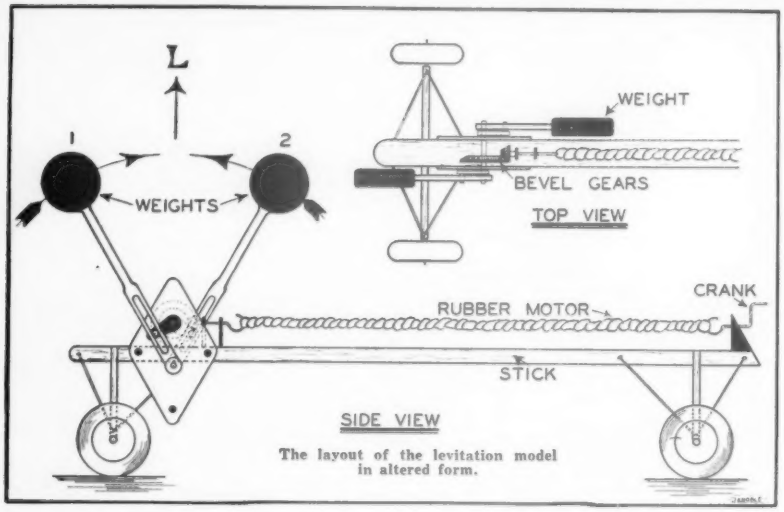
Aileron Control. The use of ailerons for controlling the lateral (sidewise) attitude of an airplane.

Ailerons (Differential). A system in which the up-moving aileron travels farther than the down-moving aileron, thus avoiding yaw or deviation from the path of the plane.

Aileron Drag. The horizontal resistance or drag force due to the ailerons.

Ailerons (Floating Type). Ailerons free to take up their own position, the right and left ailerons being connected together so that they can move freely when they move together, but they move in opposite directions from any position when the pilot moves the control lever.

Here's a Clever Levitation Model



The layout of the levitation model in altered form.

EVER SINCE that levitation article appeared in P. A., we have received a host of new ideas and new developments on the subject, which of course, is just what we hoped for. This article has started our inventors to working, and in so doing, the story has fulfilled its purpose.

But best of all, we are in receipt of a letter and a sketch of a model levitator of simple construction from Leonard Theodore, 31 N. Poplar St., Elizabethtown, Pa. Mr. Theodore claims that a decided lifting effect is produced and we have therefore reproduced his sketch with which we have taken certain liberties that will be explained later.

The Leonard levitation model is based upon the oscillating principle in which a lifting force is produced by the centrifugal action of a swinging weight. In short, he has a single swinging lever, pivoted at one end and carrying a four ounce lead weight at the other end. This is given its swinging motion by means of a crank working in a slot, which in turn is actuated by rubber strands through a pair of bevel gears. During its swing, the weight creates a lifting force, which it is claimed, lifts the front end of the model.

It may come as a surprise to some of our readers, but it is true that reducing the radius of the swinging weight (or the length of the arms) increases the lift. As a matter of fact, making the arms half as long as shown will double the lifting effect.

Now, in our version of the model (you know we can't keep our hands off of any idea that comes in), we have substituted two swinging weighted links for the single weight shown by Mr. Theodore in his sketch. This was done in order to eliminate horizontal forces, so far as possible, that cause a great deal of vibration. Weather permitting, we will build a model of this sort and give you all of the dope obtained from our experiments. In the meantime, we'd like to hear from other readers who have tried the stunt, or better yet, other stunts so that we can have a variety.

GLOSSARY OF WORDS, TERMS AND PHRASES — DIC-A-8

Aileron Flutter. Vibration of the ailerons.

Aileron (Frise). A balanced aileron, hinged about one third from the leading edge, that reduces yawing or unbalanced drag.

Aileron Horns. The lever arms or cranks by which the control cable is attached to the ailerons.

Ailerons (Interplane). Ailerons placed between and to the rear of the upper and lower wings of a biplane.

Ailerons (Negative). Ailerons rigged so that they make a small negative angle of incidence when controls are in neutral. They eliminate yawing and unequal drag.

Aileron Roll. The stunt of rolling an airplane around its longitudinal axis by use of the ailerons.

Aileron Rolling Moment. The effectiveness or righting ability of an aileron in turning the plane around its longitudinal axis.

Ailerons (Skewed). Ailerons set diagonally near the tips of the wings at an acute angle with the trailing edge.

Aileron Spar. An auxiliary spar or wing beam used for the support of the ailerons.

Aileron Spoilers. Small auxiliary flaps or baffles used at the leading edge of the wing to reduce the lift on one end of the wing.

Aileron Strut. A vertical rod used for connecting the ailerons on the upper and lower wings of a biplane so that the ailerons will work together.

Aileron Turn. Turning the airplane horizontally by employing the unequal drag of the ailerons, the vertical rudder not being used.

Aileron Yaw. The tendency of unbalanced ailerons at the ends of the wings to swing the ship around in a horizontal plane, requiring the use of the vertical rudder to maintain a straight flight.

Aileron Yawing Moment. The measure of the tendency of unbalanced aileron drag toward turning the ship to the right or left.

VELOCITY CONVERSIONS—TAB-V-23

(1) M.P.H.	(2) (M.P.H.)²	(3) $\sqrt{\text{M.P.H.}}$	(4) FEET/MIN	(5) FEET/SEC	(6) KILOM/HOUR
106	11236	10.2956	9328	155.4666	170.554
107	11449	10.3441	9416	156.9333	172.163
108	11664	10.3923	9504	158.4000	173.772
109	11881	10.4403	9592	159.8666	175.381
110	12100	10.4881	9680	161.3333	176.990
111	12321	10.5357	9768	162.8000	178.599
112	12544	10.5230	9856	164.2666	180.208
113	12769	10.6301	9944	165.7333	181.817
114	12996	10.6771	10032	167.2000	183.426
115	13225	10.7238	10120	168.6666	185.035
116	13456	10.7703	10208	170.1333	186.644
117	13689	10.8167	10296	171.6000	188.253
118	13924	10.8628	10384	173.0666	189.862
119	14161	10.9087	10472	174.5333	191.471
120	14400	10.9545	10560	176.0000	193.080
121	14641	11.0000	10648	177.4666	194.689
122	14884	11.0454	10736	178.9333	196.298
123	15129	11.0905	10824	180.4000	197.907
124	15376	11.1355	10912	181.8666	199.516
125	15625	11.1803	11000	183.3333	201.125
126	15876	11.2250	11088	184.8000	202.734
127	16129	11.2694	11176	186.2666	204 343
128	16384	11.3137	11264	187.7333	205.952
129	16641	11.3578	11352	189.2000	207.561
130	16900	11.4018	11440	190.6666	209.170
131	17161	11.4455	11528	192.1333	210.779
132	17424	11.4891	11616	193.6000	212.388
133	17689	11.5326	11704	195.0666	213.997
134	17956	11.5758	11792	196.5333	215.606
135	18225	11.6190	11880	198.0000	217.215
136	18496	11.6619	11968	199.4666	218.824
137	18769	11.7047	12056	200.9333	220.433
138	19044	11.7473	12144	202.4000	222.042
139	19321	11.7898	12232	203.8666	223.651

Is Effortless Flight Possible?

by FRED CORY PETERS

The flight method, known to science as the Katzmayr effect, is somewhat suggestive of perpetual motion but it is without a doubt, a feasible system. Can we fly without engines or with less power is the question raised in this article.

IT IS acknowledged that the science of aerodynamics is still in its infancy. Many new facts are being continually discovered concerning the reactions taking place in the fluid known as air, and among the strangest of all discoveries is the so-called Katzmayr Effect—little known to the average reader.

Now, in the offset, the Katzmayr Effect rather savors of perpetual motion, but it is not a "something-for-nothing" device in reality. It can be proved both mathematically and in the wind tunnel that negative drag or negative resistance is possible in fact, and negative drag is the same thing as a self-contained positive propelling force attained without the aid of external motors, engines or rockets.

At present, this idea has been of little interest, even to scientists, but we believe that the principle might possibly be applied in a practical sense and if not a complete method of propulsion within itself, could be utilized to reduce the duty performed by the present aviation engines.

And even before Katzmayr, several well known investigators among the early groups advanced analogous systems of self-propulsion. Among these theories were those of Prof. Langley, outlined in his "Internal Work of the Wind," and the "Leading Tangential" of Otto Lilienthal. Both of these men pointed to the effortless flight of certain birds, and on several occasions produced models that demonstrated a decided tendency toward negative drag. And then came Katzmayr with even more illuminative experiments made possible by modern wing sections and the modern wind-tunnel.

Of course, it is not sufficient to simply nullify the drag of the wing alone to attain self-propelled flight. There must also be a sufficient excess of the forward component to overcome the additional resistance of the body and the other structural parts. But, from data at hand, it would seem that this excess forward component is present in the Katzmayr development. In any event, some assistance by such an arrangement would be welcome even though it only reduced the power demand by 10 per cent.

To start at the beginning, let us first consider the relations existing between the forces acting on the wings in ordinary flight, and from this point build up to the idea of negative drag. Such primary forces are shown by Fig. 1 where the wing develops the upward lifting force shown by the arrow (L). Coincident with the development of lift is the drag force indicated by the arrow (D) which opposes forward motion in the direction of the air-stream.

The total effect of these two forces is to produce the resultant force (R), passing through the C. P., which is the equivalent of the lift and drag. The drag arrow points in the direction of the air-stream because the air-stream tends to drag the wing back with it, and to prevent the wing from drifting with the wind, and thus losing its lift, a force equal to (D) and in the opposite direction must be produced by the present engine and propeller. In the case of a kite, the drag is opposed by the tension of the kite-string.

Now, in Fig. 2, we show the lift (L) as before, but with the diagram turned about so as to illustrate the idea of the negative drag (—D). This also gives us a negative resultant (—R), both of which oppose the drifting tendency and tend to hold the wing against the wind.

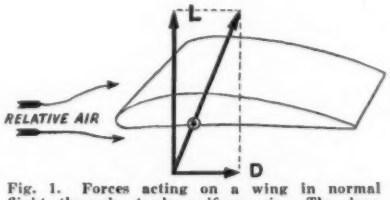


Fig. 1. Forces acting on a wing in normal flight through steady uniform air. The drag (D), or the resistance acts with the air-stream toward the right.

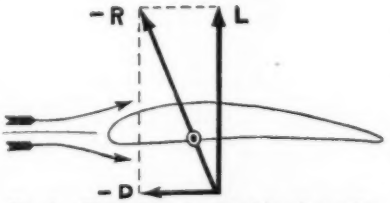


Fig. 2. Illustrating the principle of negative drag in which the drag (—D) is reversed and acts against the air-stream.

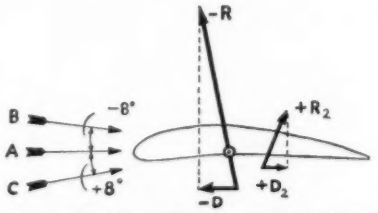


Fig. 3. How the negative drag (—D) is created in the Katzmayr effect by varying pulsating air currents acting on the wing.

Fig. 4. A suggestion as to a method of obtaining negative drag by means of a flexible trailing edge on the wing.

It is doubtful whether this can be attained with the present type wing in a uniform stream of air, but the diagram illustrates the results that must be obtained for negative drag. The drag (—D) must be equal and opposite in direction to the positive drag (D) in Fig. 1 to propel the wing alone, or greater if it must overcome the additional drag of the body and other structural parts.

However, to obtain the benefits of negative drag, we must fly the wing in a properly pulsating air-stream or in a series of rapid air oscillations which alternately strike the airfoil at definite positive and negative angles of attack. Katzmayr discovered that when a rapidly pulsating stream of air is alternately applied, first at a positive angle of 8 degrees and then at a negative angle of —8 degrees to the normal direction of air flow, that the drag is reduced and even converted from a positive to a negative value. In his experiments he reduced the drag coefficient from +0.000041 to —0.000045 with very little effect upon the lift.

With the wing stationary, as in Fig. 3, the normal air-stream is along the arrow (A) making a small positive angle of attack with the wing. By some means, the air-stream is now diverted along the arrow (B) which makes a negative angle of attack of —8° with the wing and therefore gives a small lift and a small resultant ($+R^2$). The drag ($+D^2$) is positive.

However, when the oscillation directs the air along the arrow (C) at a positive angle of attack, giving a much greater lift, as at the resultant ($-R^1$), we have the negative drag ($-D^1$), directed against and opposing the air-stream. This, because the greater lift in the negative direction of the drag, gives an average negative drag throughout the cycle of oscillation, making it possible for the wing to advance by its own accord into the wind. The total variation between the extreme positions, is 16° angle of attack.

Now, to convert this idea into practice requires the invention of some device to produce the air pulsations as shown. Or, taken in the reverse sense, to rapidly vary the angle of the wing to the air-stream. Possibly, this result could be attained by oscillating the nose only, but these are matters that

would require a great deal of experimenting.

Now, we have had many reports of birds soaring with motionless wings where no vertical air currents were apparent. And the writer has witnessed soaring flight by gulls where vertical currents of any great magnitude were entirely absent. Therefore, it would be possible that the gulls employed a means of sustention the same or similar to the Katzmayr principle in maintaining fixed wing flight. And in support of this idea, it will be noted that the wings of a gull, when seen at close range, do have a rapid vibration that must vary the angle of attack periodically. Part of this flutter is due to the extreme flexibility of the trailing edge of the gull's wings which effectively changes the angle of the wing to the breeze.

It is said that the results are independent of the frequency or rate of the vibrations, at least this was so in the wind-tunnel tests, but in practice it would be necessary to choose a sufficiently high frequency so that the inertia of the airplane would hold it in position during the short period of positive drag.

It has long been known that a wing with a flexible trailing edge presents less resistance in normal flight than a non-flexible model of the same wing presents in a wind-tunnel test. Perhaps this is due to this very principle.

For example, let us take a glance at a flexible edge wing such as the old time Caudron or Kny shown by Fig. 4. Here we have the wing section in normal flying position shown by solid lines, the chord being (A-A), which corresponds to the arrow (A) in Fig. 3. A sudden gust of wind now strikes the wing, flexing it into the position (C) with the chord at (C-C) so that the wing is now virtually making a negative angle of attack. The drop of pressure, after the passing of the gust, releases the trailing edge so that it drops to (b), the chord now making a very high positive angle of attack with the air-stream.

This, in effect, is practically the same as the deviations of the stream in Fig. 3 and it is just possible that this might lead to an approach to negative drag. There are, however, certain practical difficulties with a wing of the type shown by Fig. 4 but they would not seem to be unsurmountable. The flexible wing recently described by J. D. Van Vliet in POPULAR AVIATION might well be adapted to this purpose. This might also be the reason for the flying qualities of the Van Vliet plane.

Again, this might take the form of a wing slot oscillator or air guide vibrating in front of the nose so that the air would be diverted at the proper angles. There is no way of forecasting just what could be applied to the best advantage to obtain the effect of variable oscillating wing mechanisms.

END.

The Aero-Sportswomen

by JOAN THOMAS

JUST AS Jeanette Rankin will go down in history as the first woman to be elected to Congress, so will Phoebe Fairgrave Omlie be known as the first woman aviation executive in *any* Government. She is, Special Assistant for Air Intelligence, National Advisory Committee for Aeronautics.

It is a notable honor, but one that is richly deserved. No other woman holds such a record for continued and steady advancement in the aviation industry. A record that has developed with, and passed through, all the colorful stages of the industry from the barnstorming days of 1912-25, to the present highly-developed and complicated transportation systems and manufacturing interests.

It was in 1919, when President Wilson visited St. Paul in the interests of the League of Nations, that Phoebe Fairgrave, then a highschool student, was so thrilled by the aerial demonstration put on in honor of the President, that she determined then and there to learn to fly.

"I hadn't given a thought to aviation until that day," she said, "but suddenly, as I watched those planes I wanted to fly."

And, acting on the sudden urge, this slim youngster—barely five feet tall, and weighing less than one hundred pounds—arrived at the field and announced that she wanted to buy a ship. W. A. Kidder, president of the company, took one of his crack pilots aside and told him to take her up and to do every stunt that he knew, to make her so sick that she would never want to see a flying field again.

Obeying instructions, Major Miller, a former war-time flyer, looped and rolled, went into tail spins and power dives, let the ship fall off one wing and then the other, and then threw in a couple of tight spirals for good measure. Coming down he grinned back at his passenger and wanted to know how she liked it.

Mrs. Frances Marsalis (left) and Helen Richey who set a new women's endurance record of 9-days, 21-hours and 50-minutes in their plane, "Outdoor Girl."

Mrs. Phoebe Omlie, one of America's pioneer women pilots, just after the completion of the Fourth National Reliability Tour.

"Fine," she said, "I'll be back tomorrow with the money for the ship."

She bought the ship and learned to fly when she was 18 years of age. Her first instructor, Lieutenant Vernon C. Omlie (whom she married two years later) was seriously interested in the development of commercial aviation, "but in the meantime, we flyers have to eat," he said, in reply to a question as to why he took part in the flying-circus stunts. "I know we will have to pay for it later, because the more difficult and dangerous we make it look the harder it will be to get the public into the air. But at present it is the only thing to do."

Phoebe thought it over and decided that she would go into the same game. Thus began this amazing career of parachute jumping, wing-walking and stunt flying. At 20, she owned and was the star performer in the Phoebe Fairgrave Flying Circus. She was the first woman to ever attempt a double parachute jump and she established a world's altitude-record jump from the dizzy heights of 15,200 feet.

But always with an eye to the future, the Omlies gathered information and studied possible sites for future commercial bases for aeronautical activities. In 1921 they concentrated their work throughout the South where they thought the climatic conditions and slower railway communications offered an ideal section for developing a mode of transportation that would be of benefit to the entire population.

In 1923, they organized the Mid-South Airways Co., Memphis, Tennessee. Mrs. Omlie acted as instructor in flying, aerodynamics, meterology and

(*Concluded on page* 184)

Air-Brakes for Douglas DC-1

The Douglas Airliner on the Transcontinental and Western Air is now equipped with wing air-brakes in order to check the forward speed of the plane in making landings and for making landing possible within smaller areas.

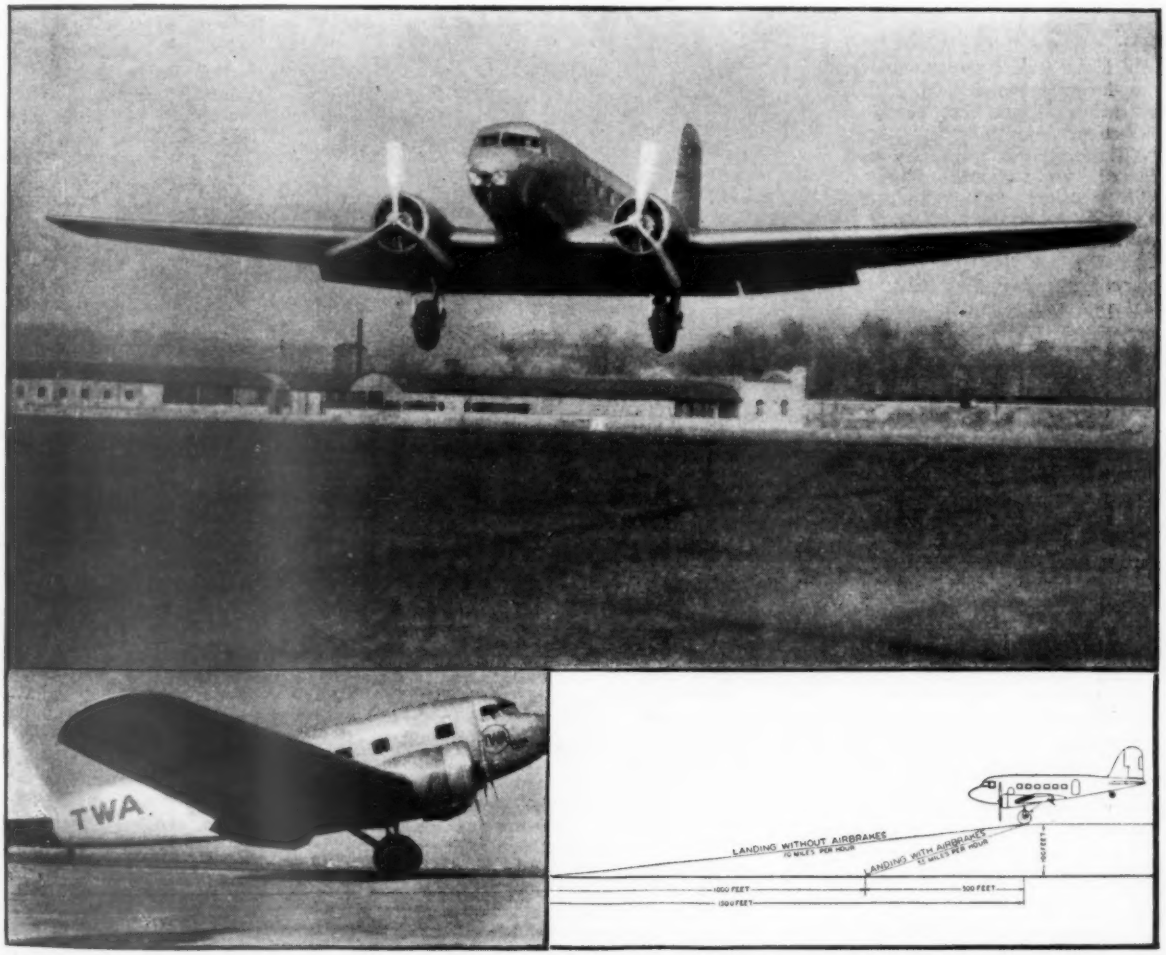
WITH THE demand for more and more speed by passengers on commercial air lines, aeronautical engineers were faced with a serious landing problem. Heretofore the faster the plane flew aloft, the faster the speed with which it must touch the ground on landing. "Air-Brakes" shown in the accompanying picture have solved the problem. They appear for the first time on a transport plane on this TWA luxury airliner, a fleet of which are now under construction for Transcontinental and Western Air, Inc. The air-brake, located on the trailing edge of the wing, reduces the landing speed to about 55 miles an hour and also reduces the space necessary for landing by two-thirds. This device represents an achievement in aeronautical design and development leading to a safety factor heretofore considered impossible.

When the brake flaps on the trailing edge are depressed, they tremendously increase the drag or air resistance so that the plane is slowed up, but this is not all there is to the story. If the speed were simply checked, the plane would stall and pancake, so that it is evident that the flaps must also momentarily increase the lifting effect at the same time so that the plane is still supported at the lower speed.

This attains much of the effect attained by wing slots combined with trailing edge flaps except that it avoids the complication of the leading edge slots. The speed is reduced from 70 m.p.h. to 55 m.p.h. without stalling and with the plane under perfect control. When not in use, as in normal flight, the flap is raised by the pilot and forms part of the normal trailing edge of the wing. The flap, as will be seen, forms only the inner portion of the trailing edge, the two outer sections near the tips serving as ailerons.

Effectively, the gliding angle is reduced from a 10:1 ratio to a 5:1 ratio because the drag is increased at a greater rate than the lift component. This is clearly illustrated by the diagram below, where the ship is shown gliding in from a height of 100 feet.

While this is not entirely a new idea, the same scheme being shown on the Bishop plane of 1912 and on several others, yet is unique from the fact that the idea has seldom been applied on commercial planes.



UPPER PHOTO. A Douglas transport plane on the Transcontinental and Western Air lines, making a checked landing by the application of its brakes. The brakes are the depressed flaps seen on inner portion of the trailing edge of the wing. **LEFT.** Here, the air-brake flaps can be seen more clearly on the trailing edge and near the fuselage. The outer trailing edge surfaces are the usual ailerons. **RIGHT.** This diagram shows the saving in landing space when the brakes are used.

The New Stinson Airliner "A"

A brand new type of commercial transport plane for a new service on the airways. Its purpose and mechanical features are discussed in an interesting manner by B. D. DeWeese, vice-president of the Stinson Aircraft Corporation.

A NEW TYPE of high-speed low wing Tri-motor Airliner, powered with Lycoming Transport engines and designed to fill a new place in scheduled air transportation, will be placed in production early this spring, according to an announcement just made by B. D. DeWeese, Vice President and General Manager.

"The design of the new Model A Stinson Trimotored Airliner was begun in 1932," said Mr. DeWeese. "Our problem was a peculiar one for we did not want to build a large transport for long-haul transcontinental operation as all of our experience had been centered on smaller units for frequent short-haul service. A survey of the situation in 1932 indicated the need for a fast trimotor of good performance which would sell at a lower initial cost than the large transports and operate at lower cost per passenger mile.

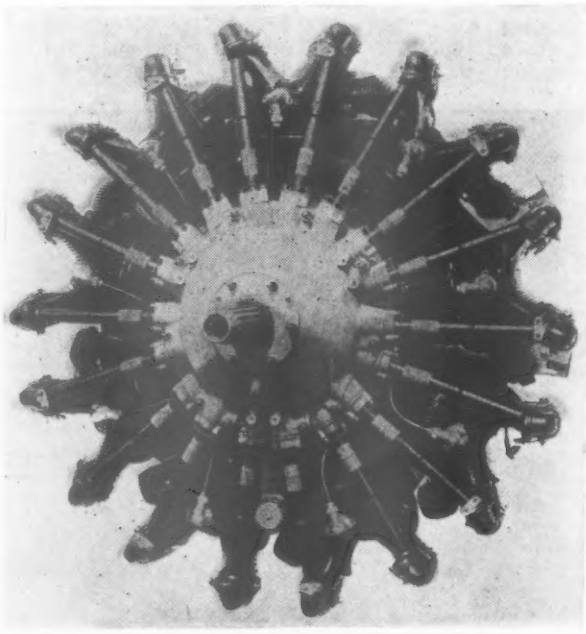
"These planes would be needed, we reasoned, for bad weather flying and night flights, but principally for use as high speed 'Parallel Feeders' for the big planes, meaning that our airliners could handle the mail, passenger and express business from the intermediate cities now inadequately served by the big planes because of the added costs of such stops and reduced through speeds. Our arrangement permits the big planes to jump these intermediate but productive cities and thus speeds up through schedules.

"For example, high speed service is now available from coast to coast, but the transcontinental planes do not stop at such important cities as Albany, Rochester, Dayton, Cincinnati, and others of equal importance. To furnish the same superior service to these cities the Stinson Airliner could leave terminals an hour in advance of the transcontinental plane, stop at the intermediate cities, collect passengers and deliver them to a terminal at which the transcontinental plane made a regular stop, thus providing a service not available now.

"The lessons of 1933 clearly proved that our prophecy was correct as the need for this airliner is now obvious to the operators of all major airlines in this country with the exception of those interested only in the race for transcontinental supremacy.

"Some of the airlines also have routes which cannot support the big planes and these will need smaller planes to do the job more economically, while at the same time offering superior transportation as regards speed, comfort and multimotored safety.

"We also uncovered the fact that many foreign countries must have modern high speed multimotored airplanes. The new Stinson Airliner meets their requirements because it does not require either the finances or traffic to support the big planes which are doing so well on the main traffic lanes in the United States.



The Lycoming Model R-680-5 9-cylinder radial air-cooled engine used on the New Stinson "A." This engine is rated at 240 h.p., at 2,000 r.p.m.

"Therefore, the Model 'A' Stinson Tri-Motored Airliner, powered by three Lycoming R-680-5 nine-cylinder radial engines, rated at 240 h.p. each, was designed. It is of low wing design with the inner section of the wings 'gulled' and braced to avoid the use of the deep cantilever center sections which add too much weight and which also greatly complicate shipment and reassembly. The wheels retract into the nacelles and the speed-arresters (flaps) extend from nacelle to nacelle on the under surface of the wings and may be, if desired, operated in unison with retracting of the wheels.

"To complete this design, it was necessary to develop a new type of sesquispar cantilever wing which we originally considered first in 1931. With this wing an accomplished fact, the balance of the airplane did not deviate to any great extent from our regular construction practice as the entire structure is of chrome-molybdenum tubing, welded and heat treated in the same conventional manner as the scores of other tri-motored airliners which we have built.

"All engines are properly aproned with metal within the exhaust areas, this being several feet back of the cylinder heads and out from the center line. The remainder of the structure is fabric covered.

"The 'Airliner' is modern in exterior line and special attention has been given to seating comfort, vision, quietness, ventilation, heating and other modern airline pre-requisites. There are seats for eight large people, four of whom may face to a common center for bridge games or luncheon. The baggage compartment, to the rear of the cabin, is accessible from the inside but is loaded from the outside. Additional mail space is provided in the nacelles. A commissary is also furnished, with ample drinking water facilities and a well appointed lavatory is located in the extreme rear of the cabin.

"The cockpit is made unusually comfortable for the pilot and co-pilot, if the latter is employed on service of this type, and particular care has been exercised to have all controls within handy reach and easy to operate. Vision is excellent. A hatch is installed over the cockpit and is fitted with a large rear vision mirror for use after landing or before taking off.

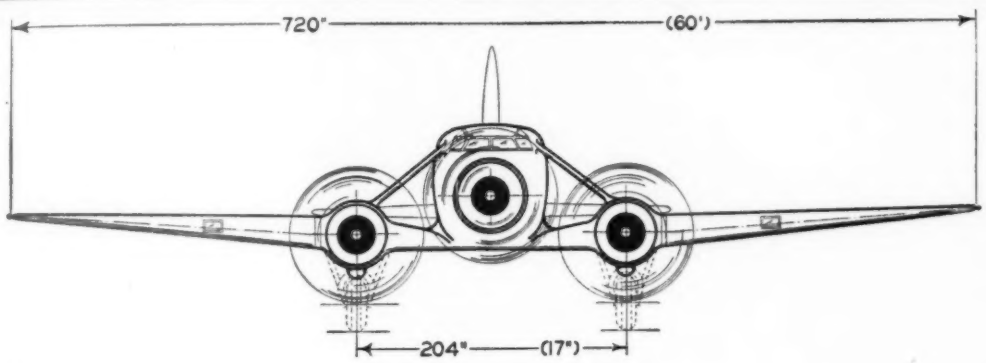
"Controllable pitch propellers are, of course, standard equipment and these are operated in unison by an ingenious device which is practically automatic after takeoff, if the pilot so desires. This feature greatly simplifies synchronization."

This new tri-motor, which is really an innovation in commercial flying, is shown in colors on the front cover of this issue. In railway parlance, it would be called a "shuttle plane."

END.

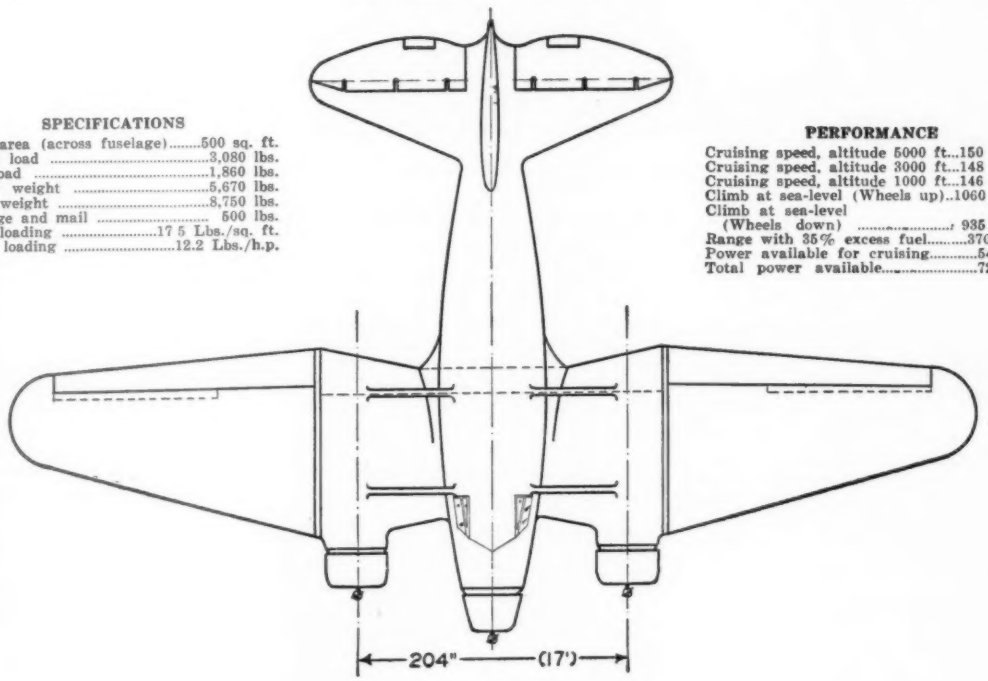
Scale Drawings of the Stinson "A"

This transport ship built for parallel feeder operation is shown in colors on the front cover of this issue.



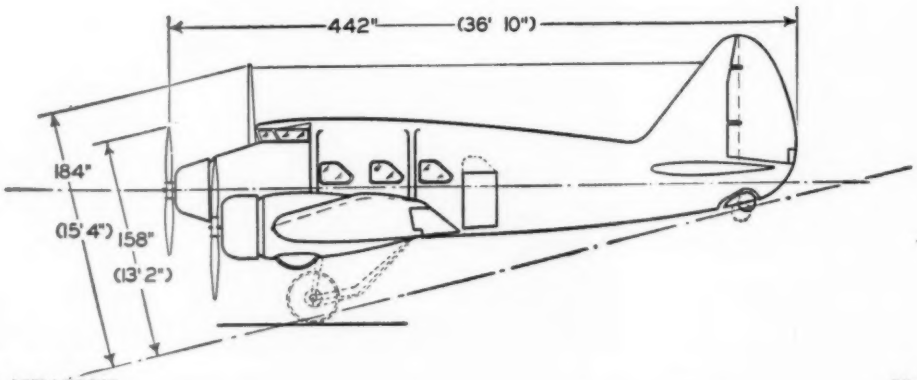
SPECIFICATIONS

Wing area (across fuselage)	500 sq. ft.
Useful load	3,080 lbs.
Pay load	1,860 lbs.
Empty weight	5,670 lbs.
Gross weight	8,750 lbs.
Baggage and mail	500 lbs.
Wing loading	17 5 Lbs./sq. ft.
Power loading	12.2 Lbs./h.p.



PERFORMANCE

Cruising speed, altitude 5000 ft.	150 m.p.h.
Cruising speed, altitude 3000 ft.	148 m.p.h.
Cruising speed, altitude 1000 ft.	146 m.p.h.
Climb at sea-level (Wheels up)	1060 f.p.m
Climb at sea-level (Wheels down)	935 f.p.m.
Range with 35% excess fuel	370 miles
Power available for cruising	540 h.p.
Total power available	720 h.p.



The Air Line Traffic Man

The traffic man selling air line tickets at the downtown office. This is an "inside job."

by
MARVIN MARTIN

Traffic representative of the largest airline in the United States.

I WORK as a traffic man for an air-line. It's an interesting job and a hard one too—sometimes on a very busy day you swear it's a "rat race" and other times you think it's swell.

There are really two classes of traffic jobs; one kind is at the downtown traffic office and the other is at the airport. In the downtown office there is usually a district manager, one or more outside men who solicit and talk up business, two or more inside men, (depending on the size of the office) and probably one or two stenographers. Here is where most of the reservations are made and tickets sold which is no small job, especially in the larger cities.

You meet and talk with big business men, world travellers, celebrities, prominent people and ordinary people, some in a hurry to get places, others going for the experience or for something to talk about and many others who refuse to travel any other way if they can help it. To you, they may make themselves interesting or disagreeable and sometimes ridiculous.

The "big shots" are easiest to handle. Take a man like Will Rogers. He is usually very matter of fact about travelling by plane and never bothers to ask anxious questions. He gets acquainted with the crew and greets them as old pals when they meet again on another trip. Movie stars or governors, politicians or just plain Mrs. Smith, they're all "space" to you. Does that level off the thrill of the game? Not in the least.

If you were asked to reserve space for the Siamese Twins would you reserve one seat or two? My answer was —neither. The plane had single seats, so a double seat from another type of plane was installed for the comfort of the Twins. They occupied one seat and paid for two.

Intoxicated passengers must be bounced and their displayed liquor is confiscated in order to comply with Department of Commerce regulations. The regulations are made for the protection of the irresponsible party as well as for the other passengers on the plane whose lives could be endangered by some fool act of one not in possession of his sober mind. In such cases we refund the passenger's money and cancel passage.

Transportation of animals used to be another matter. One night I was confronted with this perplexing problem. Should I reserve a seat for the trained eagle which a prominent English passenger carried as "hand baggage" when application for the last vacant seat had been made by another person? They were all booked to ride in a small mail plane (now out of use) and the Englishman objected to paying for a seat for his eagle. Eventually one passenger failed to show up and the trained eagle rode as hand baggage, his "small" crate, (barely wedged through the cabin door) occupying all the seat space adjoining the Englishman's seat.

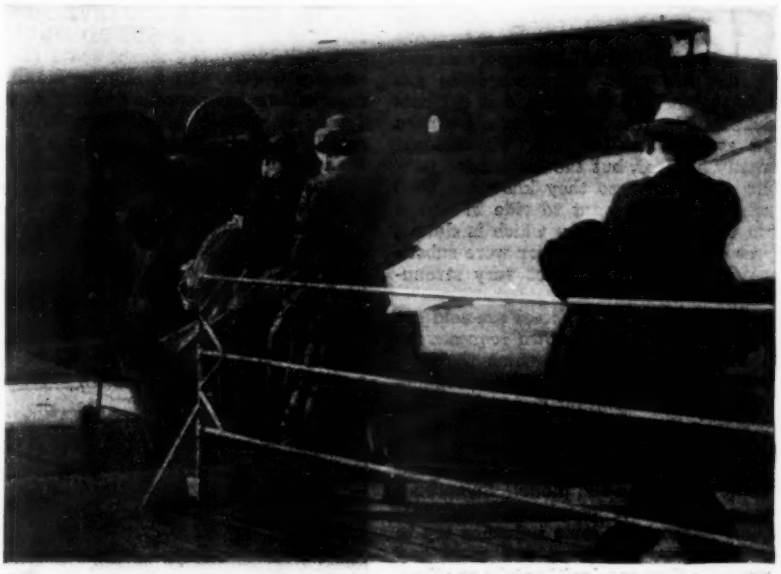
A prize bulldog, a present enroute to President Roosevelt, received more attention from some of the crew than Mrs. Ann Roosevelt Dall did on a later trip. Considerable amusement was derived from a radio message saying that a live alligator was coming in the next plane, the message not stating that the alligator was scarcely a foot long and securely boxed. Animals are no longer carried by my line, as they are

The operations dispatcher, through the radio system, keeps the traffic department in touch with the planes while they are flying along the airways.

Has a Most Interesting Job

MR. MARTIN has prepared a most interesting and amusing story of a department seldom heard of by the public. This is the traffic department that transacts the business end of a commercial airline.

The traffic agent makes the acquaintance of all sorts of people, and in addition to having a thorough knowledge of air line operations, must possess tact, quick judgment and resourcefulness in dealing with the travelling public.



All aboard! The passengers are embarking on the plane which will be in the air within a few minutes. It is the duty of the traffic department to provide the passengers and to see that they remain "sold" on air travel.

potential nuisances in the passenger cabin and are hard to protect from freezing or suffocation in the baggage compartments.

A large percentage of the people are riding for the first time and have many questions to ask. Some of them must be sold on the idea of getting both feet off the ground.

The arguments presented to the prospective passenger are many. The person of course realizes he will save time, but the actual time saved must be shown by comparison. Then you can prove to him that air fares are about the same as charged by trains, etc., by showing him where the cost of Pullman berths, meals and tips are eliminated. In most cases, the saving in time, together with the greater scenic beauty of the trip, more than compensates for the extra dollar to two above competitive fares.

The traffic man's courtesy and willingness to assist gives the traveller the feeling of personal and individual attention which compliments his ego. In most other lines of travel, the passenger is herded and forgotten. You always try to give out correct and reliable information as to the most direct and cheapest route without trying to route the passenger in a round-about way just to get him to travel on your particular line for a greater distance. The passenger always comes first with us and in satisfying and pleasing him from start to finish, a tremendous amount of good-will is created and held. Thereafter, when that person thinks of travel he immediately arranges to go by air if possible.

Arriving at their destination, the airport traffic man (left) greets them and answers any questions that the passengers may ask.

Another argument some lines have over others is equipment—by this I mean types of planes, fast or slow, single-motored or multimotored, blind flying equipment, one-way radio or two-way radio, one pilot or two pilots, stewardess or no stewardess, the company's and pilot's years of experience, comfortable or uncomfortable planes, quiet or noisy planes—and their safety record. Good equipment is expensive, both to purchase and to operate, but companies having the best are rewarded by the traveling public's confidence and patronage.

When the passenger makes his reservation, he is asked his local address and phone number so that he can be contacted in case there will be any weather delay in starting. You also inquire if he will have his own transportation to the airport or use the company's bus service for which there is a usual charge of from fifty cents to one dollar per person, depending upon the particular city. All of this is noted on the reservation chart together with other pertinent facts such as his destination, space reserved on connecting air lines, or for his return trip if he is purchasing a round trip ticket, also the ticket number.

If he does not have a ticket, you try to sell him one as far in advance as possible, because if he purchases a ticket it usually means that he really intends to go. This has been very definitely proven by the records of passengers holding reservations but no tickets, who fail to use the space reserved for them or notify us that they have changed their minds about taking the trip.

In these cases, the company is sometimes a double loser because in holding space for the passenger who failed to show up, they have probably turned down requests made by other people who really wanted to go after the plane was sold out.

The traffic man, in addition to knowing all about the service offered by his company, must know something about all the other main airlines in the country. Frequently, a passenger will wish to go to some distant point not reached by your line. You immediately look at the airway map showing all the cities in the country served by all the lines, then figure out the best route, the best connections, how much it will cost, how long the trip will take, and, if he wishes definite reservations made on the connecting line or lines, you wire for the space. The leading lines in the country have ticket agreements with each other, so that one line can sell a ticket over the other lines and the passenger on starting his trip may pay for it right through to his destination.

Quite often, during the summer months, the planes are sold out several days in advance, especially on the trans-continental lines. To the outsider, this seems hard to believe. Dur-

ing the past summer, the line I am connected with probably turned down almost as many people as they carried.

You ask, Why don't they run more planes? That is easy to answer. During the heavy summer traffic, the company seldom has enough planes to spare for second sections. As rapidly as new planes are built, more schedules are added, but still the demand is not satisfied. The line has lots of old planes in storage, or for sale, which could easily be used, but the air-minded public are getting so they know the kind of planes they want to ride in and if an older type of plane which is slower, less comfortable or noisier were substituted, they would object very strenuously.

Frequently, when planes are sold out and you are turning down requests for space, some people who think they are very important and must be accommodated make exorbitant demands. They overlook the fact that another person's money is just as good as theirs, and try to pull all sorts of gags, strings and angles to get on the plane. Sometimes they have other people who they believe might have some influence try to secure space for them, and exert any pressure they can legitimately or otherwise.

One day, a short time ago, I had five different people or agencies phoning for space for the same person on a plane that was sold out. He went on a later plane when he found he could not force me to give him a seat on the trip he wanted.

In the larger traffic offices there are usually one or more reservation clerks who record the space as it is sold on the charts used for the purpose. When other stations along the line have sold their allotted space and need more, they wire for it to the stations who control space. Also if space is needed on a connecting line, the reservation clerk wires the other line to try to secure the space needed.

During the past summer, one space controlling station sent and received several hundred wires every day. Naturally, using the telegraph so much is a tremendous expense, so to partially offset this, all of the leading lines agreed on a code system whereby a few code words would cover the complete message.

For instance, suppose the San Francisco office has space only as far as Chicago for a passenger bound for New York. The passenger's name is Johnson. He wishes to leave on the 7:30 P. M. plane, Saturday, November 25, boarding at San Francisco. The wire to the Chicago office would read: "Need Johnson ACGNK SUNOD NOVBF SATOD NOVBE BODSF."

Eight words tell the entire story. The word "Need" means we want space; the second word is the passenger's surname; in the third word, A means one person, CG means Chicago, and NK, New York; SUNOD stands for Sunday trip 4; NOVBF, November 26; SATOD means arriving Chicago on Saturday's Trip 4, NOVBE, November 25; in BODSF, BOD means boarding, and SF, San Francisco.

If the space from Chicago to New York was available for our passenger, Chicago would reply: "CONFIRMING JOHNSON ACGNK SUNOD NOVBF SPC," the word SPC means space (SP) number 3 (C). In a similar manner reservations are cancelled, changed, refused, or return space secured, and usually it is not necessary to use more than eight or ten words in a message.

It is obvious that the traffic man at the city office is right in the center of most of selling and business transactions regarding reservations and tickets and the development of new business. The traffic man at the field does not have as many big deals to handle, but he does have a greater variety. His job might be classed as a combination of ticket agent, reservation clerk, cashier, bellhop, baggage man, express man, official bouncer, information man, telegraph boy, weather prophet—or in other words he is an all round man who takes orders from everybody and tries to keep the passengers happy.

"If the field traffic man has from seven to ten passengers boarding at his station, there is plenty for him to do."

Passengers usually arrive at the airport about ten or fifteen minutes before departure time—that is, if they use the bus transportation arranged by the air line. Frequently passengers drive to the airport in their own cars and arrive at the last minute thinking all they have to do is get in the plane. But to the traffic man's sorrow, that is not the case. It takes from two to five minutes to handle each passenger, and for a plane to depart on time it is necessary to begin boarding the passengers about five minutes beforehand. The Post Office Department, upon whose patronage many airlines depend for support, is very strict about delays in departure caused by passengers who arrive late and for this reason most companies will not wait beyond the scheduled departure time.

If the field traffic man has from seven to ten passengers boarding at his station there is plenty for him to do in the few minutes before they leave. Once the author delayed a plane for seventeen minutes—the unpardonable sin of traffic duty. In this case there were eight passengers boarding the plane and they reached the airport ten minutes before departure time.

Two of them did not have tickets, so I had to make them out and one of them was a rather complicated round-trip ticket with passage over a connecting line. Two passengers had tickets to points beyond where they were going on this trip, so their original tickets had to be exchanged for new tickets to cover the stop-over en-route. I weighed and checked the baggage, and found four people carrying in excess of the 30 pounds limit. Each one had to argue and whine when presented with the charges, which are from 5 cents to $1 per pound depending on the distance the person is traveling.

Some people do not feel that they are going anyplace unless they have fifty or sixty pounds of baggage. Governor Rolph of California carried considerable baggage at first, but in the course of many trips up and down his state learned to travel light.

To each of my expostulating passengers I explained that a plane can carry only so much weight safely and that cargo space is limited—therefore there must be some regulation made to discourage an excess amount of baggage rather than the small amount of income the company derives from it. One of the four decided to send one of his bags by rail express. I took care of this and waited while another made up his mind whether to leave part of his baggage behind, or express it.

I thought that I was through. Then a portly gentleman decided that he needed an accident insurance policy. The skinny little guy with the excess baggage watched me make out the policy and then took one himself. By this time, two more thought it was a good idea so the plane waited while I made out four insurance policies. Well, the plane was only 17 minutes late.

As the transport plane circles above the airport and heads toward the next city, I now inform the operations department of the number of passengers going to different points on the line, the amount of excess baggage and how many passengers want cabs waiting for them at the first stop. The operations dispatcher radios this information to the other stations along the line or sends it by telegraph or teletype, according to the method used by the particular company.

Now, another plane is due any minute. The stewardess and new pilots are waiting to board. Preparations for taking the baggage from the plane are being made. The dispatcher, the pilot's

(*Concluded on page* 184)

Investigating Squalls

IN AN effort to learn how to forecast wind gusts and squalls, whose unexpected appearance constitute one of the gravest airship dangers, the Guggenheim Airship Institute has been conducting comprehensive experiments at Akron, Ohio.

Both wind velocity and direction instruments, now being used at the Institute, record their findings by means of photo-electric cells. A pair of instruments is located at each of three sides of the Akron airport. The records of the three stations are plotted at the Institute and from the combined graphs gusts may be accurately forecast.

Aviation scientists had their attention drawn forcibly to the importance of gust forecasting by the airship Akron disaster, for it was brought out at the investigation of this tragedy that wind gusts, absolutely unexpected, played a part in causing the crash.

What Would You Do?

OF COURSE, in any given case, you can always turn to page 77 of your correspondence school instruction book on "How to Fly"; but pilot Vance Breese, who had a crash in California, nor pilot William Brooks of Pennsylvania, happened to have an instruction book handy when the motor fell out of their planes.

Breese was flying a Ryan monoplane with 8 passengers over San Francisco a few years ago when the radial engine parted company with the fuselage at 1200 feet. Oil was whipped into the pilot's face to make matters worse. Somehow the ship was safely landed on a hillside without so much as a scratch to any of the passengers. The motor was found 4 feet in the ground.

Pilot Brooks lost the engine off a biplane at 1500 feet over Allentown, Pennsylvania. He landed safely.

Take Plenty of Warm Clothes

FREDERICK H. BECKER, test pilot for the Wright Corporation in 1925 and squadron commander during the war, had a unique experience during an altitude test he was making on a Wright Apache above Mitchel Field. At 5 miles a 100 mile an hour wind took charge of Becker and his plane. When he landed, he had found himself in a field near Kingston, Massachusets, 160 miles from the field where he had taken off.

It's a Tough Life

IF Miss Jane Clarke of New York City is asked to christen any more airplanes, she hopes the champagne bottles are more fragile than the one she wielded at a ceremony at Roosevelt Field. Attempting to christen a new plane, NIRA, she hit the propeller with a bottle of champagne. The propeller was dented, but the bottle remained intact. Her second effort to break it also was futile, but on the third trial the by-now-breathless Miss Clarke managed to smash the bottle.

A New Italian Engine — The Alpha-Romeo

THE new Italian air-cooled radial aviation engine, known as the "Alpha-Romeo" (D/2), built by the noted automobile manufacturer of that name, Milan, Italy, has shown an exceptionally fine performance. The D-2 has shown up well in the national races and in the attainment of high altitude.

It has a rated capacity of 283.9 h.p., running 2,000 r.p.m., at an elevation of about 10,000 feet. The nine radial cylinders are provided with flanged heads of light alloy and also with a volumetric compressor that maintains a constant output up to an elevation of 10,000 feet. All of the auxiliaries are protected by the special bell housing which permits, at the same time, an accessible arrangement of the oil piping.

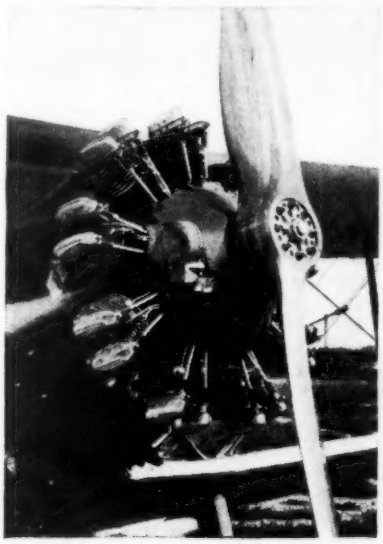
Mounted on a Caproni "109" plane, a school or trainer type, this engine reached an altitude of 31,000 feet, an excellent showing but one which the makers believe can be exceeded when the engine is installed in a more efficient type of airplane.

SPECIFICATIONS OF ALFA-ROMEO D/2

	Metric	U. S. Std.
Cylinder bore	120 mm.	4.72 in.
Cylinder stroke	135 mm.	5.32 in.
Cylinder displacement	1374 cu. cm.	168.9 cu. in.
Compression ratio	5 :1	5 :1
Normal R.P.M.	2000	2000
Weight, without hub	255 kg.	561 lbs.
Horsepower	280 CV	283.9 h.p.

Particular care has been taken in the design of the lubricating system and the rocker-arm housings so that the loss of lubricating oil is at a minimum.

Because of the high cost of gasoline in Italy, where aviation gasoline frequently reaches 60 cents per gallon, great care has been taken in designing the engine so that the fuel consumption is at a minimum. It is claimed that the Alpha-Romeo has a fuel consumption of only 0.45 pounds of gasoline per horsepower-hour which is decidedly low, particularly for a small engine.

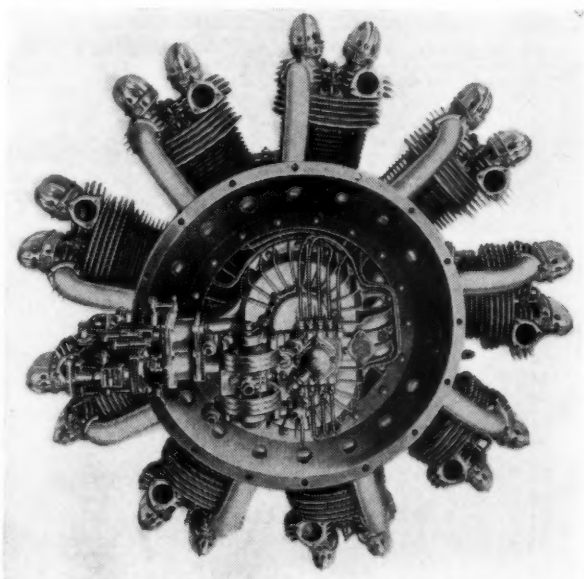


The Alpha-Romeo radial air-cooled engine installed in the O. C. school training plane.

The "volumetric compressor," or the supercharger can be seen through the opening in the bell housing mount. This device is of the lobed or gear type of compressor instead of the centrifugal high-speed type most commonly used in this country. It is strange that the simple positive lobed type has not been more commonly used because of its lower speed and more positive action.

Approximately, the weight per horsepower (without the propeller hub) is 2.0 pounds. The volumetric horsepower equivalent is 5.3 cubic inches displacement per horsepower. Because of its low compression ratio (5:1) the horsepower per displacement is rather low, but on the other hand, this is attended with certain advantages such as freedom from ignition trouble, less stress and smoother running.

The parts appearing in the air-stream are well disposed so that the head resistance is low in spite of the fact that no cowling of any sort was used.



The Alpha-Romeo (D/2) radial air-cooled engine (rear view). This engine has a rated output of 283.9 h.p. at 2,000 r.p.m. The compressor maintains a constant output up to 10,000 feet elevation.

New Ideas on Air Navigation

by LIEUT. COMMANDER P. V. H. WEEMS, (Retired)

WITH several centuries of development and refinement, the marine navigator has numerous tables available, constructed for his special convenience. The world-renowned Bowditch tables are a good example of the collection of nautical tables.

Not all of the tables in Bowditch can be used for air navigation. In fact, special new compact tables are in demand for work in the air. A step has been made in this direction in the publication (in "Air Navigation,") of the "*Course Errors for Distances Off Course*," shown below and contained in the book "*Air Navigation.*"

Often, when in flight, the distance in miles that the plane is off its course, is determined by observing a known landmark. This same observation, at the same time, gives the distance the plane has flown from the last point of departure. With the distance the plane has flown, and with its distance off course, a right triangle may be constructed which will show graphically, what is really needed—the amount given in degrees that the plane is off course.

By constructing a table which gives these values in convenient form, we save ourselves the trouble of constructing the triangle for each case. Such a table is shown herewith.

For example. We leave Newark Airport for Washington in low visibility. After flying on the compass course 45 minutes, the fog clears temporarily, and we recognize a landmark which is 8 miles to the right of the course, and 80 miles along the course.

Entering the left or "Miles flown" column with 80, we move to the right to the column marked 8 at the top under 'Miles off Course," and pick out 6° as the amount we are off our compass course. In other words, we have had an unexpected wind from the east which has set us 8 miles to the west, and has held us 6 degrees too far to the right of our track course.

If we head 6 degrees to the left, we compensate for the wind drift, but we remain parallel to the course and 8 miles to the west. The next stop we are to make is 40 miles further on, and we still have to make a further correction to the course if we are to head on the most direct course to the airport 40 miles away.

Here, again, we could construct the triangle with 40 miles traveled and with 8 miles off course, but since the table gives values for various triangles, it is not necessary to look in the same column, that is for "8 miles off course," but opposite 40 miles instead of opposite 80 miles flown.

We find the new correction to the course to be 12 degrees. We therefore must make a change of 6 plus 12, or a total of 18 degrees, in order to head direct for the next airport. Obviously, on leaving the next airport, we must take off the 12 degrees correction but apply the 6 degrees correction in order to keep on our original course allowing for the east wind.

The reader will pardon this somewhat detailed explanation of a simple but convenient table when it is stated that one of our really expert air navigators, after considerable use of this table, and after speaking in the most glowing terms of its usefulness, finally complained to the writer that the table solved only half the problem, and that after you have found the plane off course, it is necessary to make a further correction to get back on the course at a desired point.

He had failed to observe that the second part of the problem was similar to the first part, and that the same small table may be used for both.

A great deal of embarrassment would often be avoided if aviators in general, even on short hops, would always note accurately the time of take-off, and at first opportunity along their course note the exact time of passing some known landmark. This gives at once the

(*Concluded on page* 188)

COURSE ERRORS FOR DISTANCES OFF COURSE

Miles flown	Miles off course															
	1	2	3	4	5	6	7	8	9	10	15	20	25	30	40	50
	Compass correction to parallel track course															
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
10	6	12	17	24	30	37	44	53	64	90						
20	3	6	9	12	14	17	20	24	27	30	49	90				
30	2	4	6	8	10	12	14	15	17	19	30	42	56	90		
40	1	3	4	6	7	9	10	12	13	14	22	30	39	49	90	
50	1	2	3	5	6	7	8	9	10	12	17	24	30	37	53	90
60	1	2	3	4	5	6	7	8	9	10	14	19	25	30	42	56
70	1	2	3	3	4	5	6	7	7	8	12	17	21	25	35	46
80	1	1	2	3	4	4	5	6	6	7	11	14	18	22	30	39
90	1	1	2	3	3	4	4	5	6	6	10	13	16	19	26	34
100	1	1	2	2	3	3	4	5	5	6	9	12	14	17	24	30
110	1	1	2	2	3	3	4	4	5	5	8	10	13	16	21	27
120	0	1	1	2	2	3	3	4	4	5	7	10	12	14	19	25
130	0	1	1	2	2	3	3	4	4	4	7	9	11	13	18	23
140	0	1	1	2	2	2	3	3	4	4	6	8	10	12	17	21
150	0	1	1	2	2	2	3	3	3	4	6	8	10	12	15	19
160	0	1	1	1	2	2	3	3	3	4	5	7	9	11	14	18
170	0	1	1	1	2	2	2	3	3	3	5	7	8	10	14	17
180	0	1	1	1	2	2	2	3	3	3	5	6	8	10	13	16
190	0	1	1	1	2	2	2	2	3	3	5	6	8	9	12	15
200	0	1	1	1	1	2	2	2	3	3	4	6	7	9	12	14

A Dainty Chassis

French tracking chassis.

HERE we have a close-up view of a French landing gear of huge dimensions and complexity as applied to a transport ship.

They have undoubtedly been influenced in this design by American freight car practice for we distinctly see the "arch-bars," bolsters and the rest of it, including the air or hydraulic brake system. The European nations have a pronounced tendency toward "tracking" their wheels fore-and-aft which may be all right on concrete but certainly not very much on soft dirt.

Above, will be seen a cumbersome shock-absorber of the rubber cord type. It takes a great many strands of rubber to support the enormous weight.

And Now — the Amateur Pilot!

AFTER parading around under all sorts of names and with all sorts and varieties of prerogatives, the good 'ole beginner pilot is now entering into another status. He is now an Amateur Pilot, a title which can be acquired with 25 hours flying time.

And, in the amendment carrying this qualification, are certain extensions of the privileges enjoyed by the Private Pilot and the Limited Commercial Pilot. The latter are now permitted to carry guests, executives and employes of the concerns employing them for unlimited distances. They are also allowed to demonstrate aircraft to prospective customers.

Hausner's Brother Takes Up Aviation

SIGMUND HAUSNER, age 17, is learning aviation at the Casey Jones School of Aeronautics, Newark, N. J. His ambition is to follow in the footsteps of his famous brother, Stanislaws Hausner, who attempted a transatlantic crossing.

Young Hausner shows great promise and is determined to obtain every license issued by the Department of Commerce, both as a mechanic and as a pilot. He is already building an airplane for his private use so that he can build up his hours and gain experience.

Keeping Your Engine Running

by MANLEY MILLS

The author gives many useful and practical hints on maintaining the engine of a lightplane and making the proper adjustments so that it will run at the highest peak of efficiency.

AIRPLANE engines must operate at near maximum power most of the time and every ounce of power counts, especially in the case of a lightplane engine.

When an engine becomes excessively worn, its power output is considerably lessened. If your engine seems to have lost its old pep and doesn't rev up as it should, it probably needs a complete overhaul which, if thoroughly and carefully done, will make the engine as good as new.

As a general rule, your engine should be given a top overhaul every fifty hours and a complete overhaul every three hundred. However, this will vary with different engines and operating conditions. A top overhaul usually consists of removing carbon and grinding valves. Tightening the bearings, if necessary, might also be included.

The first step in overhauling is to determine just what condition the engine is in. To an experienced mechanic, the sound of an engine will indicate its exact condition. The color of the exhaust will also reveal trouble. When the exhaust smoke is black, or has a gasoline odor, the mixture is too rich and should be leaned down. Blue smoke is usually a sign of oil pumping.

Skipping or missing can be usually traced to an incorrect carbureter adjustment or to defects in the ignition system such as broken or defective spark plugs, wrongly adjusted breaker points, etc. Leaky valves or pistons, or poor compression, will cause back-firing into the carbureter and loss of power.

A weak mixture, that is, a mixture deficient in gasoline, will also cause back-firing—spitting noise. It might be interesting to see just how this happens. The weak mixture burns so slowly that it is still burning when the intake valves open for the next power cycle. Consequently, the flame strikes back into the intake manifold and ignites the mixture contained therein. Although this might be dangerous under some conditions, the flame rarely ever reaches the carbureter itself.

Engine troubles can be summed up under the following headings: (1) Non-operation. (2) Faulty operation. (3) Overheating. (4) Undue noise. In regard to noises, loose connecting-rod and crankshaft bearings are the most common causes. These bearings may be taken up by removing the necessary number of shims and tightening the nuts. Remember that the bearings must be equally free at all positions of the crankshaft and connecting rods. If they bind in any position, they should be scraped with the proper tools until the trouble is remedied.

Prussian-blue, obtainable at most garages, can be used to detect high spots in the bearings. Give the bearing in question a thin coating of it, then assemble the bearing and give the crankshaft or connecting rod, as the case may be, a few turns. When you take the bearing apart again, any high spot will be indicated by a bright blue color. A well-fitted bearing will be uniform in coloring over all its surface. The same method may be used in fitting new pistons or grinding the valves.

Piston "slap" is another source of noise. The cylinder may become worn and at each revolution the piston strikes the wall with an audible slap. If this continues very long, the cylinder becomes out of round with consequent loss of power and compression. In such case, the only thing to do is to have the cylinders rebored and install new pistons and rings.

If wrist pins are loose, they will cause a slight knock. When a wrist pin is replaced, it should be a standard oversize, especially if the motor has been in use a considerable time. It may be necessary to ream out the holes in the piston to fit the new pin.

The peculiar "ping" of a carbon knock is known to most everyone, but not many are familiar with the various ways in which carbon can cause a knock. In the first place, enough carbon can accumulate to materially reduce the size of the combustion space, thereby raising the compression to a point where preignition sets in.

Then, the carbon, being a poor conductor of heat, forms an insulating layer which prevents the heat of the combustion from being carried away. This may raise the temperature enough to cause detonation. Further, the carbon itself retains enough heat to raise the temperature of each new charge as it enters the cylinder.

It was formerly believed that carbon caused preignition by becoming incandescent, thus igniting the charges. However, this theory has been proven incorrect. The pounding action of a carbon knock works havoc with the pistons, connecting rods, and crankshaft of your engine. In time, this action will weaken vital parts.

When a carbon knock becomes audible, you should either remove the carbon at once or start using an anti-knock fuel such as ethyl gasoline. This type of fuel eliminates knocking because it burns more slowly than ordinary gasoline, hence it will not detonate until a higher temperature is reached.

Carbon may be removed satisfactorily by scraping carefully, but a quicker and more thorough method, if you have access to an oxygen tank, is to burn it out. Because of the danger of fire, you must use caution, however. Drop a lighted match into the cylinder and direct a jet of oxygen upon it. The intense heat produced will ignite the carbon. However, it will burn only at a point directly under the jet, which you

A lightplane engine is reliable and efficient but it must be given periodical inspections and rejustments to keep it in proper condition.

can move around until the last trace of carbon is removed.

Now, here's why you should grind the valves at regular intervals. For efficient operation, the valves must fit perfectly in their seats. But, unfortunately, the valves and seat don't wear uniformly. In the first place, oxygen in the exhaust gas rushing past the hot valves tends to oxidize them. The main product of the combustion of gasoline is water, that causes a further tendency to rust. However, the use of special steels for the valves in present-day motors prevents this to a great extent. Then, there is the action of tiny particles of grit which are blown against the valves with considerable force, acting as an abrasive.

Valve grinding is such a familiar operation that there is no use going into detail about it here. Nevertheless, it is one of the most important items in the overhauling process.

If your engine pumps oil badly, the pistons and rings are probably worn, and the only permanent remedy is to install new ones. These pistons should be oversize, about .0025 of an inch larger than the original ones, lapped in to insure a perfect fit. The entire surface of the piston to be lapped in should be covered with a mixture of fine emery and oil. Valve grinding compound may also be used.

Fit the connecting rod to the piston and put a short piece of round stick in the crankshaft end to serve as a handle. Work the piston up and down in the cylinder, at the same time giving it a rotary motion. Continue this operation until the piston will pass clear through the cylinder. Then, every trace of emery must be removed from the piston and cylinder walls. If any is left, it will quickly ruin your engine when it is started. Wash out the abrasive with gasoline.

The valve seat and valve faces should show a uniform dull gray color without shining bright spots when they are thoroughly and properly ground to a gas tight fit. Applying a thin skim of Prussian blue to the seats and then turning the valve down on this color, should show no uneven blotches when the valve is again lifted.

While grinding the valves it is well to examine the valve stems and valve stem guides for wear and sticking. If badly worn and with much shake in the guides, it may be necessary to re-bush the guides or else obtain new valves. In any event, flush out the valve stem guides with gasoline before reassembling to clean out any gum or carbon that may be deposited at this point.

Next, try the valve springs for tension. In some cases, a spring may lose its temper by the action of heat or may be weakened from some other cause so that it does not close the valve promptly. In this case, the engine may be seriously out of time or there may be danger of the spring breaking while in flight.

QUESTION AND ANSWER DEPARTMENT

All questions of general interest on any phase of aviation will be answered authoritatively by POPULAR AVIATION'S Technical Staff.

The absence of external bracing and retractable landing gear, as in this Wibault-Penhoet plane, greatly reduces resistance and fuel consumption.

QUESTION:—Alvin H. Parker, Boston, Mass. *How does the speed of an airplane vary with the altitude? Is there any direct law governing the effect of altitude?*

Answer:—THE resistance of the fuselage and structural parts decreases with an increasing altitude, but to fly with the wings at the same angle of attack, calls for a higher speed. The efficiency of the propeller remains constant but, unless supercharged, the output of the engine decreases with the altitude.

If the engine is fitted with a supercharger, it will deliver practically the same power as at sea-level, and with a decreasing resistance, the speed will naturally be greater at high altitudes. Without a supercharger, the power drops off at high elevations so that the speed is usually lower than at sea-level.

Let us say, for example, that the sea-level speed of a certain plane is 135 m.p.h. With a supercharged engine the speed will be in the nature of 150 m.p.h. at 10,000 feet while an engine without the supercharger will give a speed of only 120 m.p.h. at the same altitude of 10,000 feet.

* * *

QUESTION:—Bernard J. Koehler, Clear Lake, S. D. *Do highly cambered wings show a greater center of pressure movement than flatter wings? What type of wing has the smallest travel of the C. P.?*

Answer:—IN general, the center of pressure travel is greatest with wings having a heavy camber to the top surface or greater concavity in the lower surface. This was the trouble with the old thin wing sections known as "sky-hooks."

The least C. P. travel takes place with wing sections of the double convex type having convexity above and below. This is evident from the fact that center of pressure travel on the top surface is counterbalanced by equal and opposite travel on the bottom surface.

* * *

QUESTION:—George L. Lee, Chicago, Ill. *How fast do the tips of a propeller travel? Is the speed much greater than that of the plane?*

Answer:—THE speed of the tips, of course, depends both upon the diameter of the propeller and the r.p.m. of the engine. For example, with an eight foot propeller running 1,800 r.p.m., the propeller tip speed will be 45,239 feet per minute or 8.57 miles

(*Concluded on page* 186)

The Farman stratospheric plane, specially designed to fly at high altitudes. It is provided with an air-tight cabin so that the interior can be maintained at sea-level pressure.

Rescue Mission by National Guard Airmen

PROMPT action of New York National Guard airmen proved instrumental in effecting the rescue of six persons forced to jump overboard from a yacht which caught fire due to the overturning of a kerosene cooking stove.

The imperiled party consisted of Colonel M. R. Guggenheim, his wife, son and three guests. Efforts to subdue the flames with fire extinguishers proved futile, due to the fumes from the flames combined with the chemical. It was impossible to reach the cabin where the life preservers were stored, as the flames barred any progress in that direction.

There was one decorative life preserver lashed to the rail of the yacht and a bumper, a buoyant cylinder of canvas-covered reed and cork. Equipped with these, the six went over the bow of the burning yacht. There were no good swimmers in the party and Colonel Guggenheim was the poorest of all. He clung to the life preserver while the others took turns hanging to the bumper.

They had been in the water several minutes when they saw a plane swooping toward them. One of the men aboard the plane, Capt. Rector, leaned out and dropped a life preserver among the little group struggling in the water. Capt. Rector and Lieut. Youmans had seen the burning yacht while they were directing artillery range finding at Fort Wright on Fishers Island.

Several miles away in Block Island Sound, an Army tug was towing a target for gun practice. Capt. Rector at once radioed the tug and, cutting loose from the target, the Army boat came to the rescue, picked up all six, after they had been in the water more than 30 minutes and took them to Fort Wright, where they were treated for exposure at the post hospital.

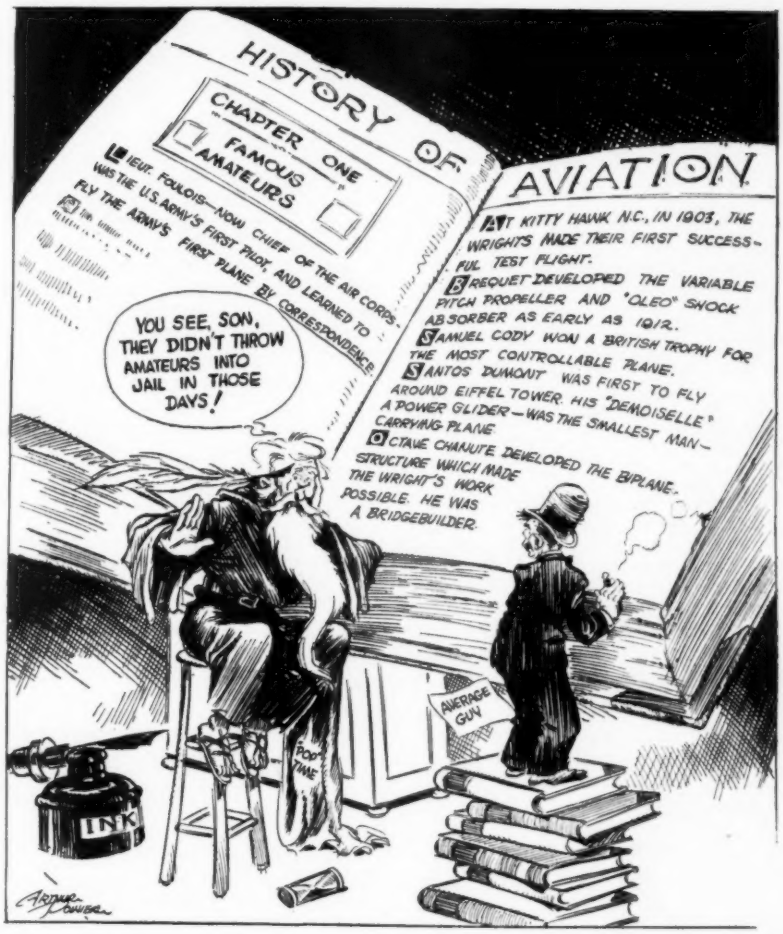
Autos Get Air Ride

THEY'VE transported new automobiles out of Detroit by train, motor truck, boat and under their own power, but it remained for American Airways to make the first delivery to dealers by airplane. A special heavy freight plane, a Stinson, has been placed in regular service and it can carry three assembled automobiles of the larger sort each trip, wheels of the cars being dismounted and hung over the sides of the plane.

Air Transport for Prisoners

PRISONERS bound for the state penitentiary from Redwood Falls, Minn., will travel in modern style. Sheriff L. J. Kise is now using his cabin plane to take convicted men to Stillwater. His first passenger was a prisoner sentenced to ten years for shooting his wife.

Those Were Happy Days for Amateur Pilots


HISTORY OF AVIATION
CHAPTER ONE
FAMOUS AMATEURS
LIEUT. FOULOIS—NOW CHIEF OF THE AIR CORPS—WAS THE U.S. ARMY'S FIRST PILOT, AND LEARNED TO FLY THE ARMY'S FIRST PLANE BY CORRESPONDENCE
YOU SEE, SON, THEY DIDN'T THROW AMATEURS INTO JAIL IN THOSE DAYS!
AT KITTY HAWK N.C., IN 1903, THE WRIGHTS MADE THEIR FIRST SUCCESSFUL TEST FLIGHT.
B REQUET DEVELOPED THE VARIABLE PITCH PROPELLER AND "OLEO" SHOCK ABSORBER AS EARLY AS 1912.
SAMUEL CODY WON A BRITISH TROPHY FOR THE MOST CONTROLLABLE PLANE.
SANTOS DUMONT WAS FIRST TO FLY AROUND EIFFEL TOWER. HIS "DEMOISELLE" A POWER GLIDER—WAS THE SMALLEST MAN-CARRYING PLANE
OCTAVE CHANUTE DEVELOPED THE BIPLANE STRUCTURE WHICH MADE THE WRIGHT'S WORK POSSIBLE. HE WAS A BRIDGEBUILDER.
AVERAGE GUY
POP'S TIME
LINK

How to Tune in the Airplane Signals

IT IS interesting to tune in on the airplane signals which can easily be done if you have a short-wave radio receiver or one of the new receivers in which both the short-wave band and broadcast band can be heard.

The following table, kindly furnished by the Western Electric Company, builders of the radio equipment used by the airlines, will give you the frequencies of the principal airline stations and planes in "kilocycles." You will notice that the airlines have different frequencies, day and night, so the position of your dial will differ accordingly.

If your radio dials are calibrated according to wavelengths in meters, you can convert the above frequency in kilocycles into meters by dividing 300,000 by the frequency. Thus:

$$\text{WAVELENGTH} = \frac{300{,}000}{5602.5} = 53.5 \text{ Meters.}$$

The figure 300,000 represents the speed of the radio waves in terms of kilocycles.

AIRLINE COMMUNICATION FREQUENCIES

Name of Air Line	Kilocycles Day	Night
American Airways	5602½	3447½
	5613½	3257½
	5632½	3232½
National Parks Airways	4917½	3127½
Western Air Express	5692½	2906
Northwest Airways	5377½	3005
Transcontinental and Western Air, Inc.	4987½	3088
	4967½	3072½
Pennsylvania Air Lines	4987½	3088
	5572½	3162½
	5592½	3182½
United Air Lines	5662½	3322½
	5122½	3147½

The night frequencies are lower (longer wavelength) because very short-waves do not carry so well at night. Where your short-wave set is provided with several independent push coils for covering different frequency bands, it will be sufficient to use a single coil covering a band of 40-60 kilocycles for catching airplane communications.

To get the best results on these short-waves will require adjustment of the antenna length. If your antenna is too long, then the set will lose its sharpness in tuning out interference.

More About the Knight Twister

by VERNON W. PAYNE

Here are the final details of that interesting little biplane called the "Knight Twister." As soon as the ship has passed its flight tests we will be pleased to publish the performance data.

IN THE former two articles on constructing the Knight Twister, we have told you how the fuselage and wings are built.

I am now building one of the latest types of the Knight Twister and drawings are included in this story that show some features of the construction of this ship. You may have noticed that the fairing on the fuselage will give a finished appearance similar to a monocoque fuselage. That is, every section of the fuselage is elliptical in shape.

In the first article describing the fuselage, I showed the cross-sections of the forward part of the fuselage, but not of the rear part.

Note Drawing 300, which is shown here. It shows and instructs you how to draw an ellipse. There are also drawings of the cross-sections of the fuselage at the various stations, numbered 1 to 4 inclusive, also a cross-section at the tail-post. The shape at the tail-post is carried out to the rudder.

The head-rest, shown at station No. 3 is gradually tapered down into the vertical fin, as shown in both cross-sections of stations Nos. 1 and 2.

In drawing Number 110, I show many fuselage steel fittings and controls that are within the fuselage. Notice in the drawing of the side of the fuselage (Drg. 110) that the elevator cable leading from the top control horn goes through the stabilizer (not crossed). The elevator cables pass under two pulleys placed under the pilot's seat. These are shown in a detail drawing No. 4.

This (No. 4) appears under the fuselage and also in the corner of the detail drawing. One of the elevator cables passes through the center of the torque tube. This is the tube that has the joy-stick attached to it.

The torque tube is ⅞ inch diameter as shown in the detail drawing (No. 2). The control horn that connects to the push-tubes, coming from the ailerons, is welded to the torque tube.

A ⅝ inch bushing, with 16 gauge wall, is welded under the torque tube and is reamed for a ¼ inch bolt. This is for the joy-stick pivot. When making the bracket that holds the pulley in the front end of the torque tube, be sure that the pulley extends down into the torque tube just far enough to hold the cable in the center of the torque tube and so that it will not allow the cable to rub on the wall.

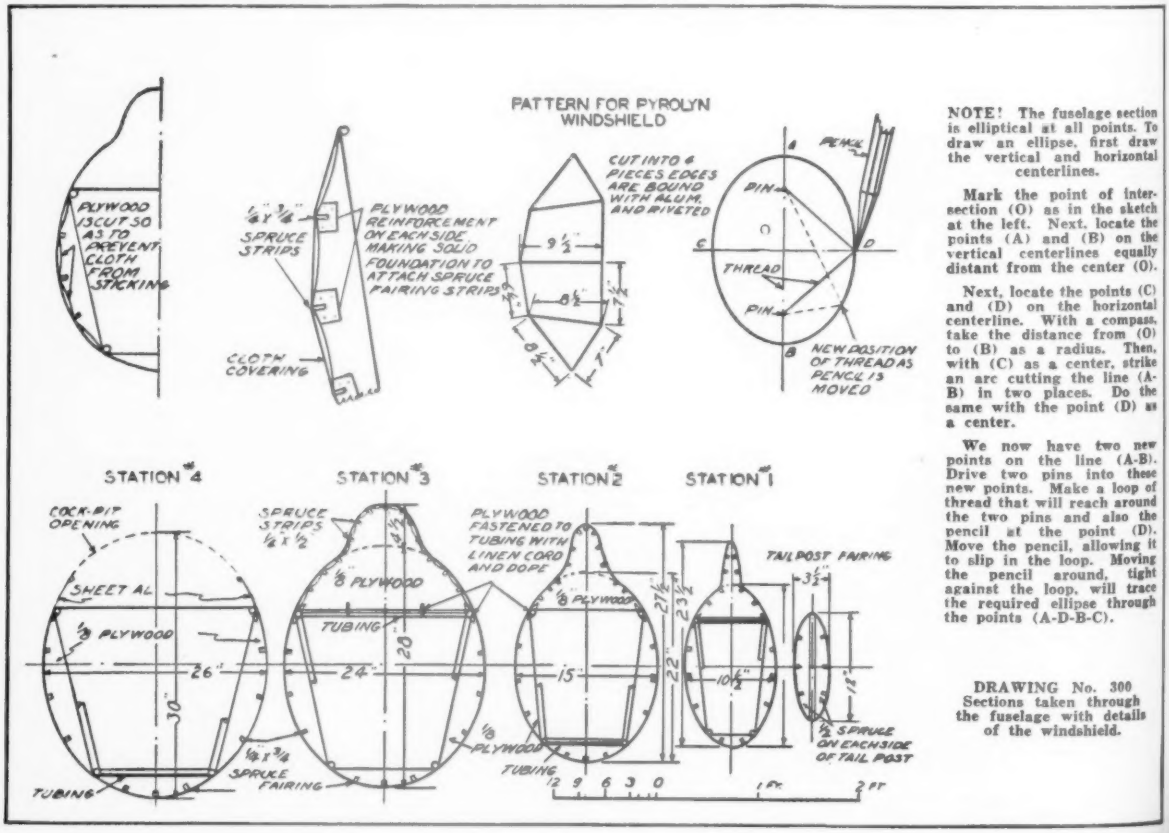
There are two collars or rings that are tack welded on the torque tube, to locate and keep the torque tube from shifting forward or backward in the front bearing. These collars are called "1 inch by 16 gauge bushings" in the detail drawing (No. 2). This means that they are one inch in diameter and have a wall thickness of 16 gauge which is .065 inch. They are ⅜ inch wide.

The torque-tube bearings are shown in Detail Drawing (No. 3) and the joy-stick is shown in Detail Drawing (No. 1). The joy-stick diameter is ⅞ inch.

Take particular notice of Detail Drawing (No. 4). There is a note, stating that four tubes of ¼ inch diameter are used as braces for the pulley housings, two to the side and two to the front or forward to the next station.

In Detail Drawing (No. 5) is shown the pedals that control the rudder. The pedals should be made and slipped on the ½ inch cross-tube with the narrow ⅝ inch by 16 gauge collars. After the pedals are properly spaced, these collars are tack welded to the cross-tube

(*Concluded on page* 188)



NOTE! The fuselage section is elliptical at all points. To draw an ellipse, first draw the vertical and horizontal centerlines.

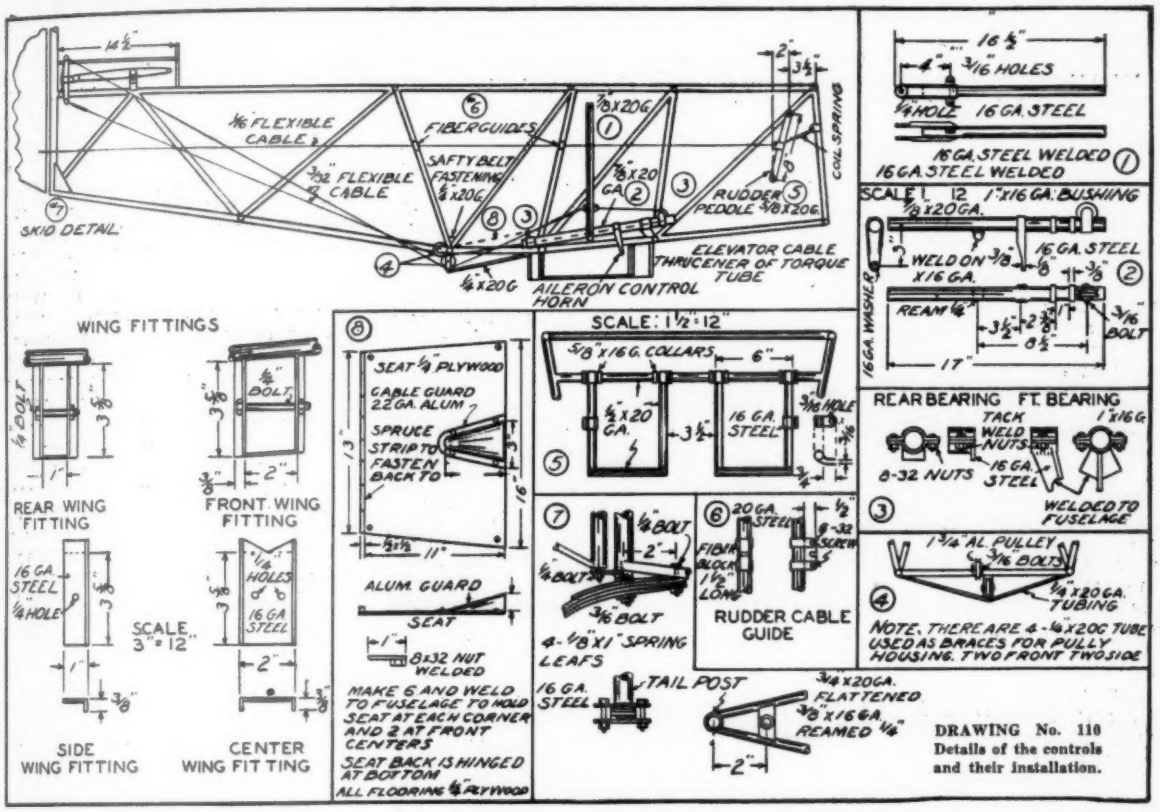
Mark the point of intersection (O) as in the sketch at the left. Next, locate the points (A) and (B) on the vertical centerlines equally distant from the center (O).

Next, locate the points (C) and (D) on the horizontal centerline. With a compass, take the distance from (O) to (B) as a radius. Then, with (C) as a center, strike an arc cutting the line (A-B) in two places. Do the same with the point (D) as a center.

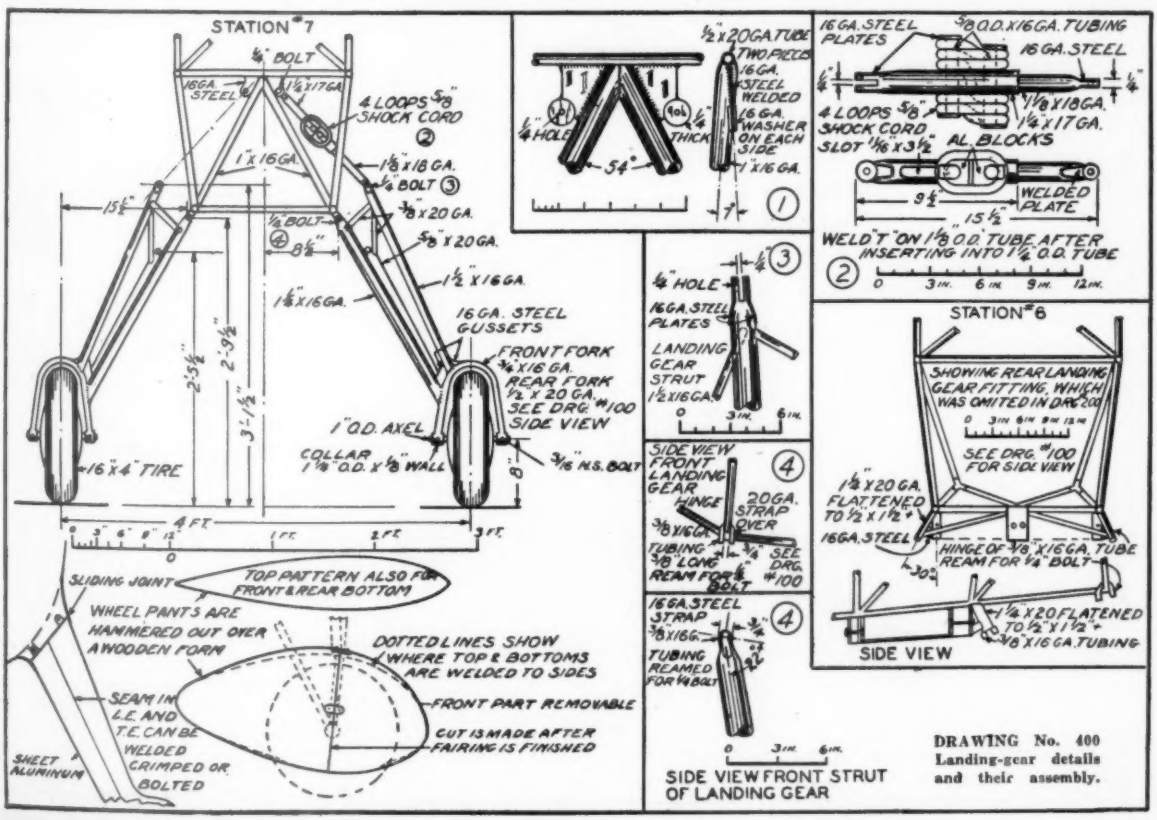
We now have two new points on the line (A-B). Drive two pins into these new points. Make a loop of thread that will reach around the two pins and also the pencil at the point (D). Move the pencil, allowing it to slip in the loop. Moving the pencil around, tight against the loop, will trace the required ellipse through the points (A-D-B-C).

DRAWING No. 300 Sections taken through the fuselage with details of the windshield.

DETAILS OF CONTROLS AND LANDING GEAR OF THE KNIGHT TWISTER



DRAWING No. 110
Details of the controls and their installation.


STATION #7
4 LOOPS 5/8" SHOCK CORD
16 GA. STEEL GUSSETS
FRONT FORK 3/4" X 16 GA.
REAR FORK 1/2" X 20 GA.
SEE DRG. #100 SIDE VIEW
1" O.D. AXEL
COLLAR 1 1/8" O.D. X 1/8" WALL
16" X 4" TIRE
3/16" N.S. BOLT
4 FT.
SLIDING JOINT
TOP PATTERN ALSO FOR FRONT & REAR BOTTOM
WHEEL PANTS ARE HAMMERED OUT OVER A WOODEN FORM
DOTTED LINES SHOW WHERE TOP & BOTTOMS ARE WELDED TO SIDES
SEAM IN L.E. AND T.E. CAN BE WELDED CRIMPED OR BOLTED
FRONT PART REMOVABLE
CUT IS MADE AFTER FAIRING IS FINISHED
SHEET ALUMINUM
1/2" X 20 GA. TUBE TWO PIECES
16 GA. STEEL WELDED
16 GA. WASHER ON EACH SIDE
54"
16 GA. STEEL PLATES
5/8 O.D. X 16 GA. TUBING
4 LOOPS 5/8" SHOCK CORD
SLOT 1/16" X 3 1/2"
AL. BLOCKS
WELDED PLATE
15 1/2"
WELD "T" ON 1 3/8" O.D. TUBE AFTER INSERTING INTO 1 1/4" O.D. TUBE
LANDING GEAR STRUT 1/2" X 16 GA.
SIDE VIEW FRONT LANDING GEAR HINGE
20 GA. STRAP OVER
TUBING 3/8" LONG REAM FOR 1/4" BOLT
16 GA. STEEL STRAP
TUBING REAMED FOR 1/4" BOLT
SIDE VIEW FRONT STRUT OF LANDING GEAR
STATION #6
SHOWING REAR LANDING GEAR FITTING, WHICH WAS OMITED IN DRG. 200
SEE DRG. #100 FOR SIDE VIEW
1 1/2" X 20 GA. FLATTENED TO 1/2" X 1 1/2"
HINGE OF 3/8" X 16 GA. TUBE REAM FOR 1/4" BOLT
1 1/2" X 20 FLATENED TO 1/2" X 1 1/2"
3/8" X 16 GA. TUBING
SIDE VIEW

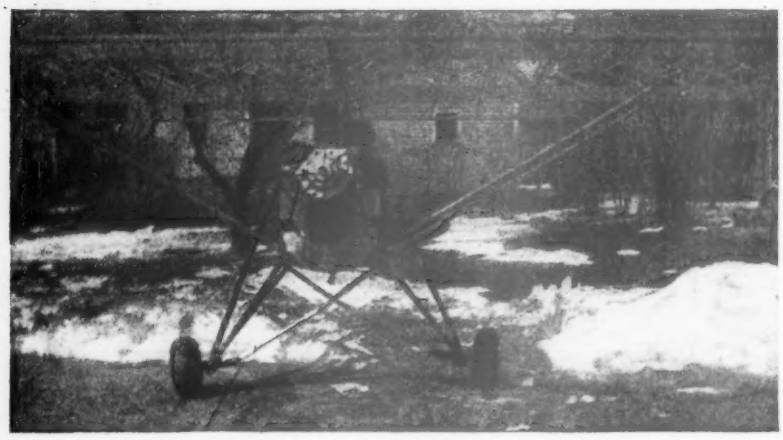
DRAWING No. 400
Landing-gear details and their assembly.

What Our Readers Are Building

A department devoted to our readers' activities in airplane, glider and engine construction, showing the latest developments.

Here Are Some Good Jobs — Look Them Over

Roy E. Haag built himself a two-seater parasol, as shown above, powered with a Model "A" Henry.



John W. Peterson has nearly finished this job and we'll wait with breathless interest until he sends in the performance details—and other details. Looks O.K. and it should perform to John's satisfaction.

This picture might bear the title, "The Snow Bird," but forgetting the jokes we call attention to the fact that Ernest Schow has produced a low-wing monoplane which is quite lonesome but interesting among all the parasols.

Here's the Dope On 'em

HERE we have the Ford motored Haag monoplane, designed and built by Roy E. Haag, Plymouth, Ind. It has been flown single and double-place with a Model "A" Ford engine, and from the data given us shows a very fine performance. For example—

Landing speed, 25 m.p.h.; Cruising speed, 65 m.p.h.; take-off run, 200 feet. This is attained with a USA-35-A wing section powered with the Ford engine. He says that it climbs 300 feet per minute, which is quite good with this powerplant and when we consider that the ship was originally designed for a 60-90 h.p. engine.

SPECIFICATIONS

Wing span	30 ft. 0 in.
Wing chord	5 ft. 0 in.
Wing section	USA-35-A
Length	18 ft. 6 in.
Height	7 ft. 6 in.
Weight empty	700 lbs.

The present model has a wood fuselage, but future ships will have a steel body. It is provided with an adjustable fin and stabilizer, baggage compartment in front of pilot and a detachable motor mount by which any 60-90 h.p. engine can be accommodated. The fuselage is covered with plywood to the rear of the rear cockpit.

Our next picture is that of the lightplane being built by John W. Peterson, 920 Ninth St., Grand Rapids, Mich. As you will see, this is a monoplane equipped with a four-cylinder air-cooled engine, but as Mr. Peterson wishes to delay further information until the test flight is made, we'll have to call off further discussion until the information arrives.

Third and last, but by no means the least, is the ship being built by Ernest Schow, Preston, Idaho. This is one of the very few low wing monoplanes that have been submitted to this department and is fitted with a landing gear (skiis) that greatly resembles the Gee-Bee. He says, that he has devised a particularly good wing-fuselage connection for this job that is something like the fitting on Frank Hawk's ship.

The wing span is 25 ft. 0 in., the chord is 6 ft. 0 in. which gives a total area of 96 square feet. It is to be driven by a converted Chevvy engine which he expects will give the job a speed of about 120 m.p.h. As shown, it is fitted with skiis for take-offs and landings on snow, the snow of Idaho being plentifully scattered around in the picture. As this is a ship of original design, we will be particularly interested in knowing how the tests came out and whether the top speed of 120 m.p.h. was actually realized.

Building A Model Wing Flapper

by **F. J. CAMM**

PART I.

Mr. Camm, a well known English model builder and experimenter, begins instructions for building an interesting ornithopter—or is it orthopter? This ingenious model will come as a change for those who wish something "different."

IT IS perhaps only natural that the earliest attempts at artificial flight sought to imitate the action of birds.

The earliest known reference, if not the earliest reference to mechanical flight, is that of Daedalus who in the Greek legends was the personification of the earliest developments in the art of sculpture and who, endeavoring to flee from the wrath of King Minos, equipped both himself and his son, Icarus, with wings which he attached to his body with wax!

Every school boy knows that the venturesome Icarus flew too near to the sun, the wax melted, and he fell into that part of the Aegean Sea which takes its name from him—the Icarian Sea.

Nothing in the world of invention is entirely achieved by one man. In the world of ideas a new thought grows like a crystal in solution, or rather like a creature seeking for sustenance and seizing with avidity upon anything of value to its own organism. It has been so with flight; for whilst these early efforts at ornithoptary were foredoomed to failure because they were too far in advance of the mechanical science of their times they did indeed serve a useful purpose in that they showed what was possible and what was not.

Of all the methods of flying by means of machines heavier-than-air, the ornithopter or orthopter has failed to be anything more than an inventor's dream. It does not require a deep mathematical knowledge to see that a full-sized flapping wing aeroplane can never be anything more than a qualified success, when we remember that most birds eat more than three times their own weight in food every day.

Scattered through the early history of aeronautics we may find here and there records of the failures of those who sought to imitate bird flight in a mechanical form. All of them were failures. None of them achieved even a modicum of success. But, as in so many other things, it is possible successfully to make in model form that which cannot be made in full-sized prototype. It has been done, but by very few.

The most noteworthy, of course, was the compressed-air driven ornithopter of Lawrence Hargraves, the Australian experimenter who produced so many successful designs for kites and model aeroplanes. He, as a fact, produced

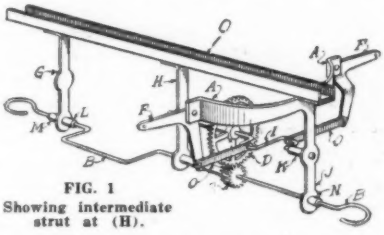


FIG. 1
Showing intermediate strut at (H).

many flapping wing models which flew for over 350 yards. Two other experimenters, Frenchmen, named Pelliocinni and Samuel, built a full-sized flapping wing aeroplane in 1909, and marketed, at one of the pre-war Paris Aeronautical Saloons, a model version of it to finance the venture.

The models were a qualified success, in that they did fly for about 50 feet. The full-size machine was a failure. There have been many other unsuccessful attempts to produce a flapping wing model, but none of them have been successful so far as I have been able to trace.

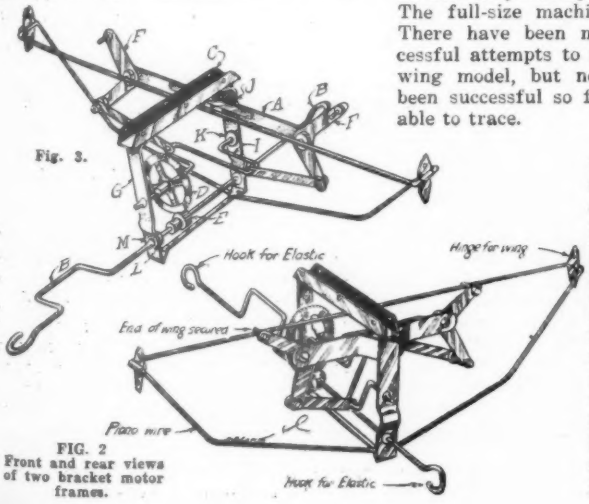


FIG. 2
Front and rear views of two bracket motor frames.

It was in 1912, after I had concluded the theory of mechanical flight through a long series of experiments on the principles of aeroplane flight through the medium of models (experiments which were afterwards incorporated in full-sized machines and were the subject of articles in aeronautical publications and read before aeronautical societies) that I turned my attention to wing flapping models.

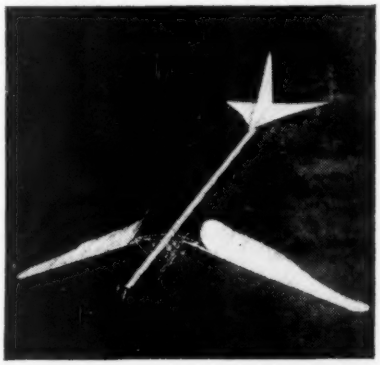


Fig. A. Photo of the completed ornithopter which has performed successful flights.

The War intervened and my job as the designer of the first successful scouting airplane in England prevented me from putting into practical effect the design for a flapping wing mechanism and flapping wing model which forms the subject of this contribution. It is a subject on which there is practically no data save a few books on bird flight and soaring which do not add much to our knowledge.

This particular model is not a suggestion; it has been made and flown, as the photograph on this page testifies. Its best duration is 15 seconds and it will repeatedly fly for this period. Naturally, I selected rubber as the motive power, as it is possible so easily to vary the power one way or the other by adding or substracting strands.

The most serious problem was that of the mechanism for correctly reciprocating the wings, and after a number of experiments I produced the extremely satisfactory device shown in the photographs attached to this article. Before proceeding to a description of this mechanism it is worth while to study the following specification:

Span: 28½ inches excluding gap between the two wings.
Camber: 1 inch maximum at root, tapering to zero at tips.
Chord: 4⅞ inches tapering to 1 inch.
Length: 36½ inches.
Total Weight: 6 ounces.
Stroke at Wing Tips: 9½ inches.
Down Stroke: 6 inches below horizontal.
Up Stroke: 3½ inches above horizontal.

(*Concluded on next page*)

Tail: Triangular, span 12 inches, length 6½ inches.
Duration: 15 seconds.

Turning now to Fig. 1, the only parts of the mechanism you will probably not be able to make yourself are the gear wheel and the pinion. You will require two gears giving a ratio of 4 to 1, the gear being about one inch in diameter and the pinion to suit. Such a pair of gears may be obtained from any clock of the alarm type.

In Fig. 1, (D) is the gear, (E) the pinion, (B) the pinion shaft, (F) articulating bell cranks, (G), (H), and (J), brackets, which are riveted and soldered to a U-section girder (C), (I) is the gear-wheel shaft, and (O) are the connecting links. (K) are distance bushes soldered on the shaft (I) to keep the position of the gear constant in relation to the pinion (E), and (N) is a similar bush fixed to the winding shaft (B).

It is not absolutely necessary to use three brackets. In the model shown in the photograph the bracket (G) has been dispensed with. If, however, it is decided to fit it (and the third bearing does tend to make the gearing run more smoothly) it will be necessary to fit bushes (L), (M), and (N).

The length of these bushes is unimportant, provided that they are a nice fit on their shaft. For that reason no details of them are given. You will easily see how the complete mechanism works by studying Figs. 1, 2 and 3. Fig. 1 shows the mechanism with the three brackets fitted. Figs. 2 and 3 show the mechanism with only two brackets fitted.

From Figs. 2 and 3 it will be noted that a piano wire frame is soldered to the mechanism so that the wings may be secured to the hinges fixed to the two ends and reciprocated by the mechanism. Fig. 4 is a schematic photo showing the completed model.

In flapping wing models the position of the rudder is unimportant and as a fact quite unnecessary. It is fitted, however, for the sake of appearance. It will be obvious that the holes for the two shafts will be absolutely dependent on the diameter of the gears.

Turning now to Fig. 3, the links (O), the articulating cranks (F), and the brackets (A), (G), (H), are all cut from 18 gauge brass and the shafts (B), (I), are of 16 gauge piano wire. It is probable that the holes in the gear and pinion will be too large for this gauge of wire and they must therefore be bushed with a piece of brass and drilled to suit. The whole mechanism, of course, is soldered to the brass piece (C), which should be of 20 gauge brass.

The bracket (A) is bent to a semicircular formation or to the form shown, and such is quite unimportant provided that the cranks and links line up with the crankshaft. The two connecting links and the two bell cranks should be made in the following way:

Roughly snip out four pieces of brass; solder together the two pieces from which the links are to be cut, mark them out, drill the hole, file up to shape, and then separate by holding in a gas flame. Make the bell cranks in the same way, and also the bearing brackets G, H, if it is decided to use the third bracket. This method ensures that the pieces are identical in shape and weight.

This is the motor and wing flapper assembled ready for mounting the wings.

The two links should then be slid over the cranks and an eyelet, or a piece of copper wire soldered round on each side to keep the link in place.

FURTHER details, describing the construction of the wings and the final assembly of this model will be found in the April issue.

Mr. Camm, the editor of the English mechanical magazine, "Hobbies" has had extended experience in the construction of unusual experimental flying models of this type, and he promises to extend all possible help to our readers who may need assistance in completing the wing-flapper, ornithopter, orthopter or what have you?

Next attach the two bell cranks S, by means of a steel pin lightly riveted over. Do not bend the two hooks for the elastic until they have been passed through the brackets, which should then be soldered to the piece C. Now connect up the links to the bell cranks S by steel pins also lightly riveted over and the mechanism is ready to receive the wings, the construction of which is shown in sheets 3 and 4.

These drawings, which will appear in the April issue, will complete the construction. With the mechanism adjusted and running freely, we will find the wing construction a relatively simple matter and is not to be anticipated with fear or misgivings.

Be sure that all of the soldered connections are firm, that all parts of the motor turn freely and without binding in their bearings. Working in sheet metal may be a new thing for many of my readers.

Why It Doesn't Fly

by RALPH PRITCHARD

WE HAVE found that weights can be added to correct a stalling model or that the correction can be made by adjusting the elevators. But this is not the best way by far. It is better to correct the cause.

Then, too, when a plane is adjusted like that, its flight is cut down to about one-half. If you find that a plane glides properly and when wound, it stalls, it is simply that you have your prop pulling up. The plane will not then stall while gliding because the prop is not working.

Instead of remedying this and shortening the flight by adding weights, just move the hole down a little ways in the nose plug through which the wire shaft passes. You will then find that the plane will fly without having excessive weights added. Warping the tail is practiced but this increases drag and when we can do it just as easily by a better way, why not do it? Do not expect to find the right position the first time but keep moving the hole until you strike it right.

Excessive incidence in the wings also causes stalling. The plane will glide until just about to land then it will pull up into a stall and drop, or if you are lucky, it will three-point. But don't expect to do this wonderful three-point with the power turned on. As soon as you fly it with the power on it will stall because of the wind from the propeller striking the bottom of the wing.

Remember that a two surfaced wing hardly ever requires more than 3° of incidence. If it has more, it is liable to stall. The way to correct this is to change the incidence and decrease the weight in the nose. If the plane still insists in stalling, look to the line of thrust.

Sometimes, especially when you are building a flying-scale model, it will be found that when both of the above mentioned troubles are corrected, yet the model still stalls or dives unexpectedly. In the case of either type of model, but scale especially, you can usually trace this back to the tail surfaces. On scale models they are usually too small and unless the designer enlarges them, they will not have enough grip on the air and will continually flap up and down and from side to side.

If you want that model to fly worthwhile, it will be necessary for you to rebuild the tail surfaces increasing their size by about one-third. It will detract very little from the scale appearance of the model and it certainly will have better stability. Of course, when you increase the size of the surfaces, you should still keep the scale outlines of the tail but they will be of a larger proportion.

Every now and then, usually in the case of scale models, the plane will

(*Concluded on page* 188)

Building the Curtiss "Goshawk"

by

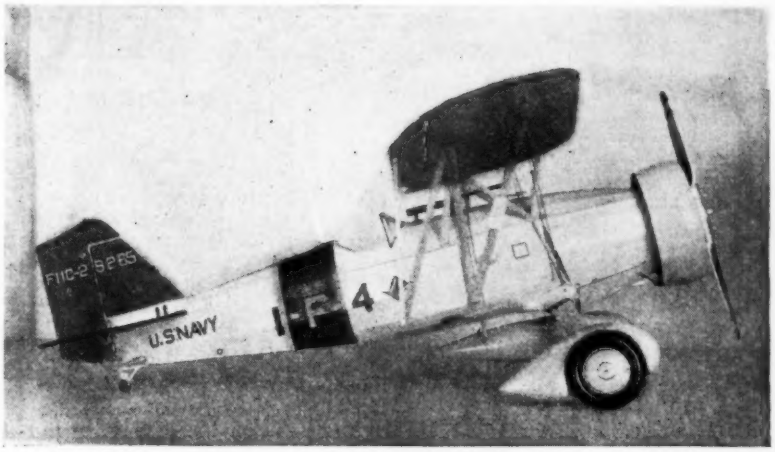
PAUL W. LINDBERG

Professional model designer

THIS model of the Goshawk has been accurately designed to scale and our laboratory tests show excellent performance with this biplane. Flights between 400 and 500 feet are easily obtained, and let us say right here that it takes to the air like the actual ship itself. After the rubber turns are exhausted you will be thrilled at the sight of your model gracefully gliding into the field for a three point landing.

There need be no fear of washing out the landing gear as our laboratory has designed an ingenious type of shock-absorber fitted into the landing gear struts. This, with adjustable control surfaces mounted on aluminum hinges, improves construction and the explicit detailed plans will be of the utmost help to the model builder.

In building the model of the Curtiss Goshawk Fighter, all dimensions can be quickly and accurately determined by placing a ruler on the part to be measured as the plan is printed full size. If you wish a larger model, multiply this measurement by the amount of increase. The color scheme can be obtained from the cover of the February issue of POPULAR AVIATION.



At first glance, this model "Goshawk" looks like the full size plane, so perfectly is it designed and constructed. It not only looks right but flies right.

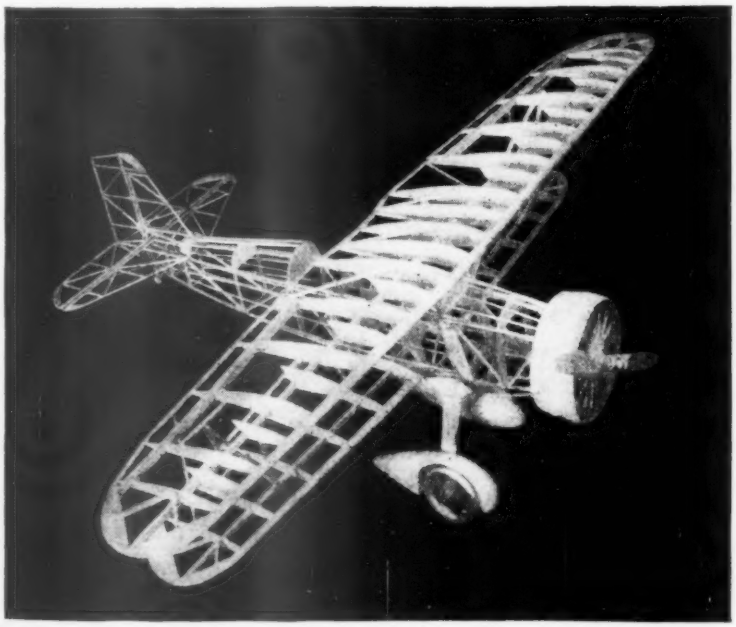
CONSTRUCTION OF FUSELAGE

The fuselage sides are built from $\frac{1}{16}$ inch square balsa. The longerons, verticals, diagonal braces, etc., are held in place until securely cemented by inserting straight pins on either side of strips wherever needed.

After the two sides are completed, they are pinned to the top of the plan in such a manner that the top longerons face down and so that the sides form right angles with the surface of the plan. The cross-members are now cemented in their proper locations. Cut formers from 1/32 inch sheet balsa and cement in their respective positions as shown on the plan.

All $\frac{1}{8}$ inch stock is used at front and rear of fuselage, made oval as shown on plan in order that 1/32 x 1/16 inch stringers may be cemented to them, and in turn carried over remaining formers to rear of fuselage. Please note that the stringers are cemented to outer edges of formers. This is necessary in order to obtain a smooth covering job, and eliminates all projecting formers or bulk heads.

Formers 5 and 6 receive stiff paper for cockpit cowling. The former between formers 9 and 10 is cut from a heavier block of balsa. Pay very close attention to the manner in which it is formed, as this forms an air passage similar to those on the large ship. After the two front side cowls have been applied to either side of fuselage, use stiff paper or balsa veneer for the side cowls.



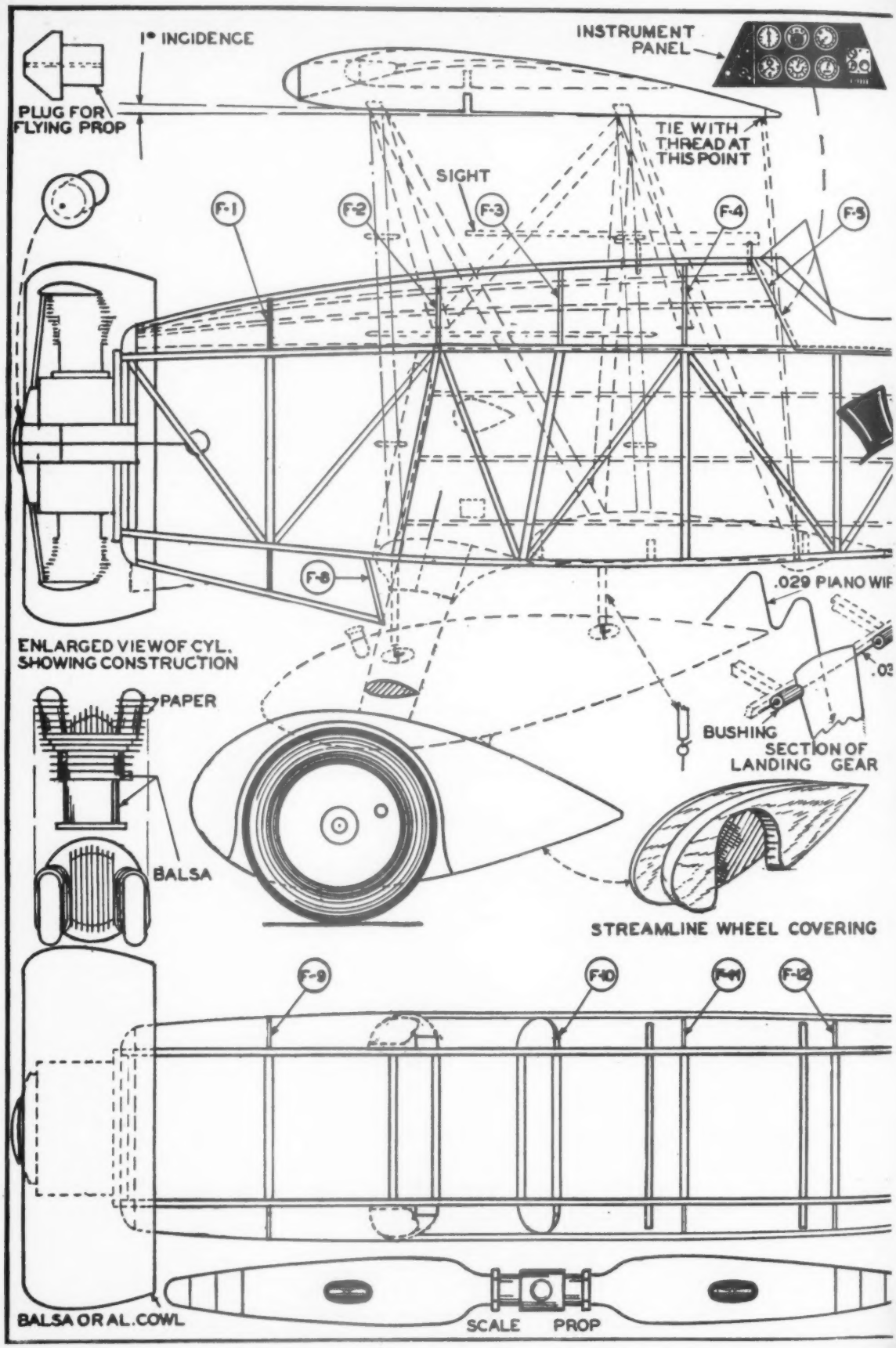
The framework of the model before covering. It looks complicated but is easy to build if the drawings on the following pages are carefully followed.

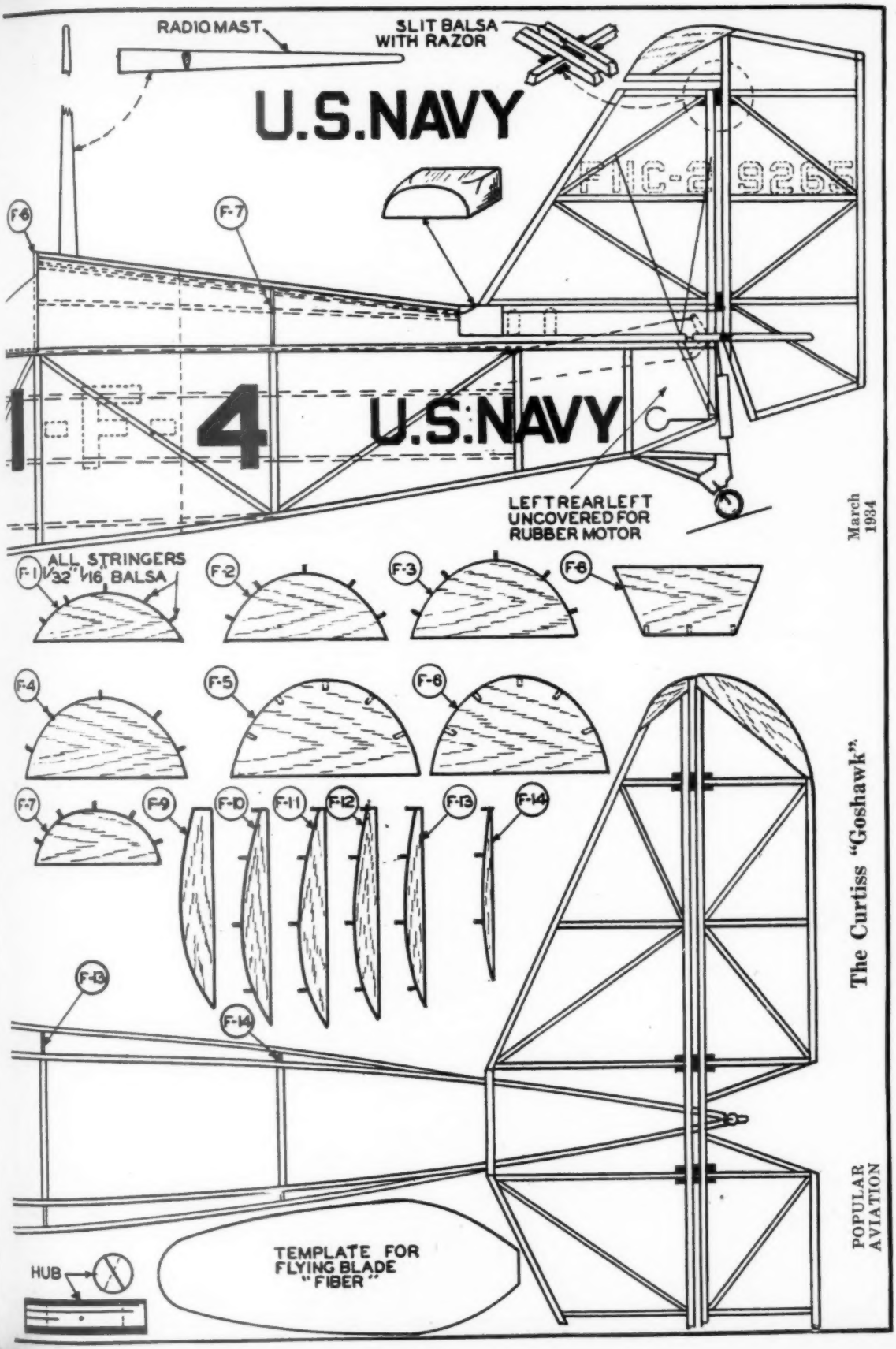
DUMMY MOTOR

The motor is built up entirely from balsa and sheets of paper. The cylinders are built first using the sheets of paper cut into disks, etc., to represent the fins. The layers in between these are made of sheet balsa 1/32 inch in thickness. These are cut smaller so as to make the cylinder more realistic. The crankcase should be made from layers of $\frac{1}{8}$ inch stock cemented together and shaped as shown on the plan. A solid block of balsa may be shaped up equally as well. After the cylinders and crankcase have been completed, cement the nine cylinders in their proper locations on the crankcase.

The rocker-arm caps and push-rods should be shaped and cemented to the motor. Paint motor entirely black before cementing to front of fuselage.

(*Continued on page* 182)

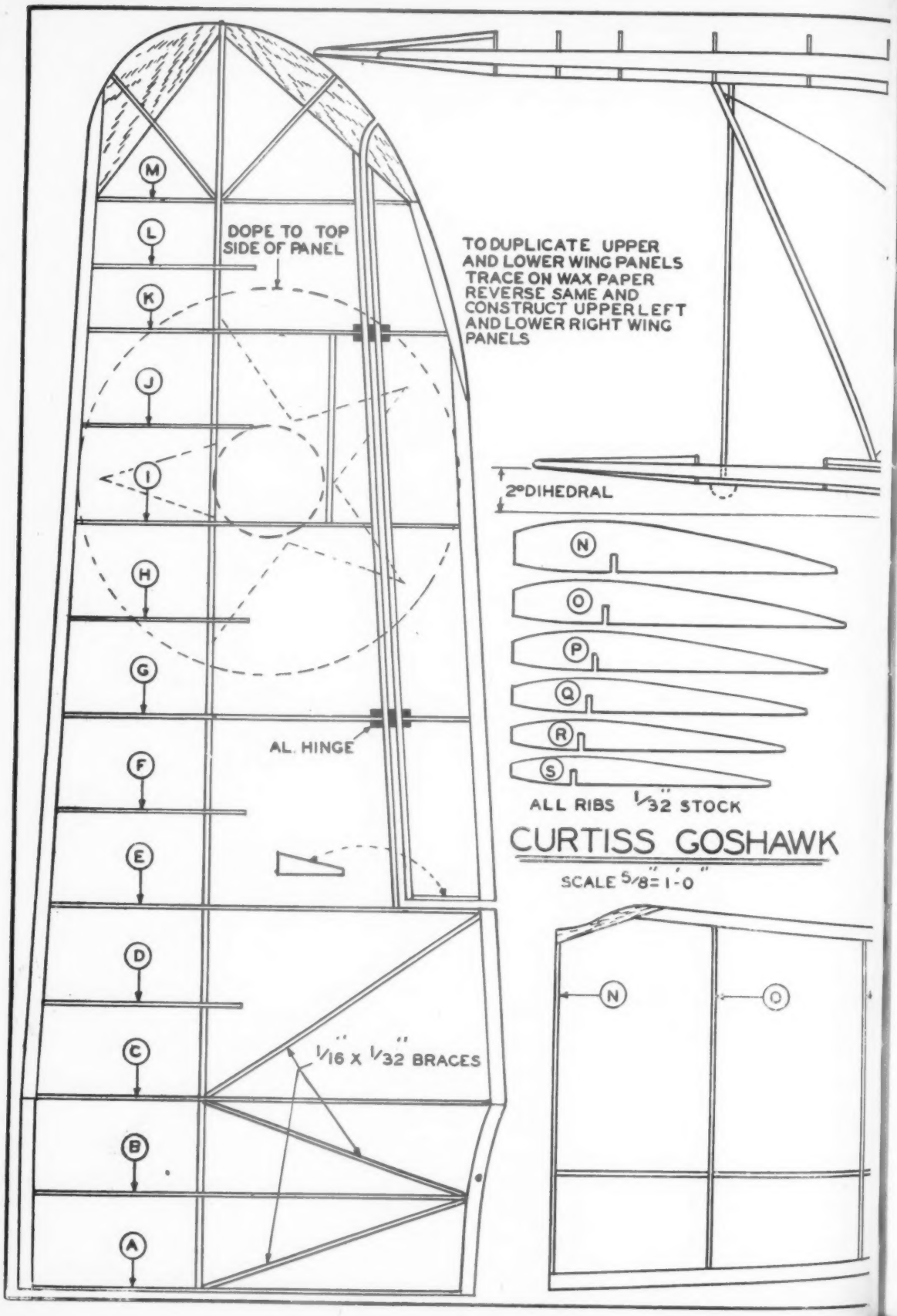

1° INCIDENCE
INSTRUMENT PANEL
PLUG FOR FLYING PROP
TIE WITH THREAD AT THIS POINT
SIGHT
F-1
F-2
F-3
F-4
F-5
F-6
F-8
.029 PIANO WIR
ENLARGED VIEW OF CYL. SHOWING CONSTRUCTION
PAPER
BALSA
BUSHING
SECTION OF LANDING GEAR
STREAMLINE WHEEL COVERING
F-9
F-10
F-11
F-12
BALSA OR AL. COWL
SCALE PROP

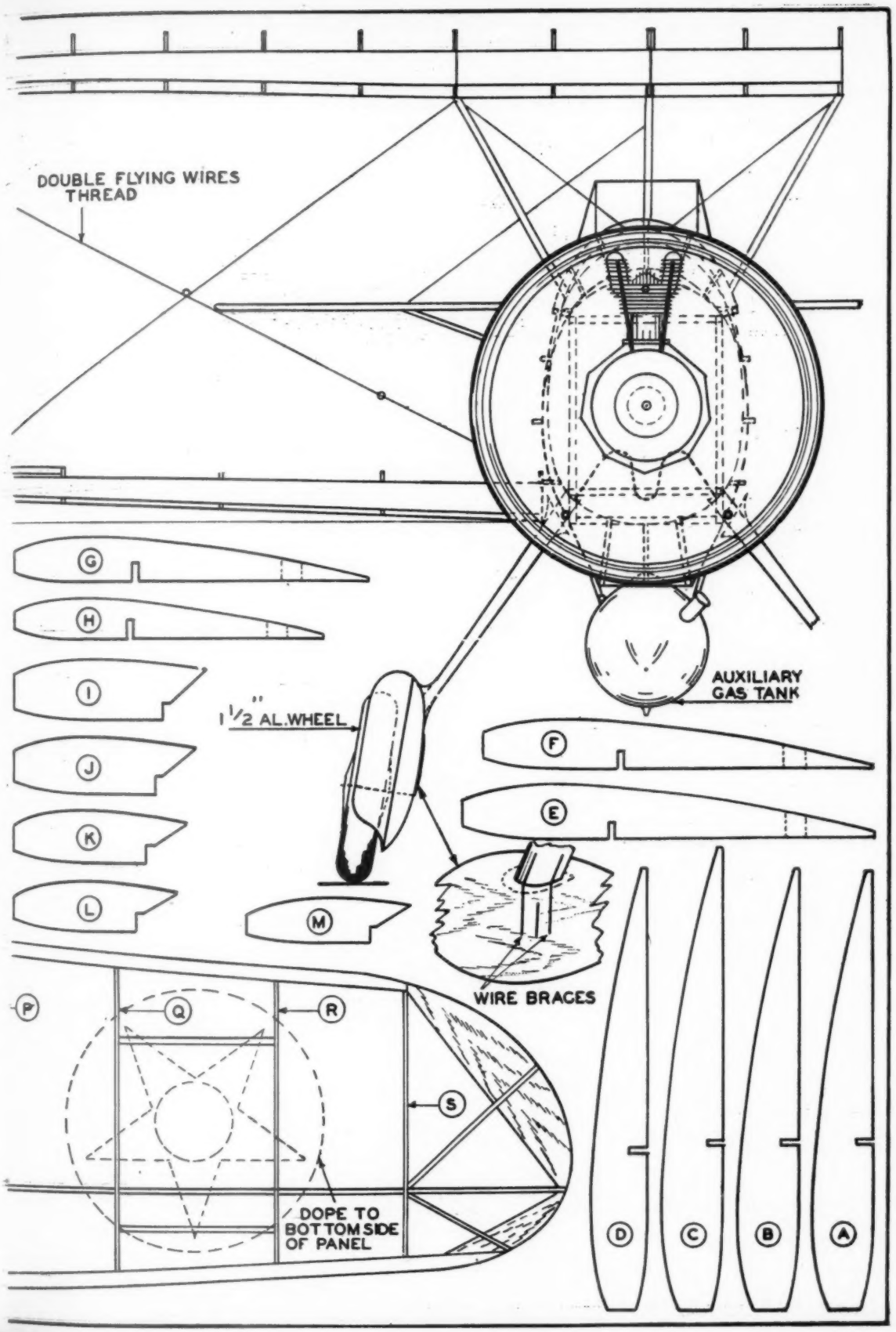


The Curtiss "Goshawk".

POPULAR AVIATION

March 1934


M
L
K
J
I
H
G
F
E
D
C
B
A
DOPE TO TOP SIDE OF PANEL
AL. HINGE
1/16 X 1/32 BRACES
TO DUPLICATE UPPER AND LOWER WING PANELS TRACE ON WAX PAPER REVERSE SAME AND CONSTRUCT UPPER LEFT AND LOWER RIGHT WING PANELS
2° DIHEDRAL
N
O
P
Q
R
S
ALL RIBS 1/32" STOCK
CURTISS GOSHAWK
SCALE 5/8" = 1'-0"
N
O
P


DOUBLE FLYING WIRES
THREAD
AUXILIARY
GAS TANK
1 1/2" AL. WHEEL
WIRE BRACES
DOPE TO
BOTTOM SIDE
OF PANEL
G
H
I
J
K
L
M
F
E
P
Q
R
S
D
C
B
A

Goshawk

(*Continued from page* 177)

A sheet of 1/8 inch balsa is used as a backing for the motor between the crankcase and the front face of fuselage.

LANDING GEAR

After selecting a strong grade of balsa, the landing gear struts should be shaped and sanded into a streamline form. By carefully studying drawing you should have no trouble in the construction of the landing gear.

The bushings at the front and rear of the shaft, which passes through upper part of strut, may be either glass, aluminum or brass. Bead bushings have been used on the model described here, and have absorbed the most severe shocks without damage to either bushings or the ship.

After the struts have been applied to fuselage, form a piece of .029 piano wire, as shown on plan and insert either end into tops of landing gear struts. Apply a coat of cement to wire at the point which it enters the strut.

The streamline wheel coverings are cut to shape and sanded so that they may be cemented to the landing gear struts. They are re-inforced at the strut by two pieces of piano wire cemented securely into position.

CONSTRUCTION OF THE WING

Cut all ribs from 1/32 inch sheet balsa. Lay a sheet of wax paper on the plan and pin leading and trailing edges and center spar in position. The ribs are now placed in an upright position in their proper locations and cemented.

Make wing tips as shown on plan from 1/8 inch sheet balsa. We recommend this type of wing tip, as it is far simpler to construct and neater in appearance.

The ailerons are now built into the panels. Ailerons will eliminate the need for building "wash-in" into wing. We recommend that you build your model with all movable controls, as you will need these to control your model under flight. Cover wing with tissue making sure all wrinkles have been stretched out of the surface, cover ailerons separately.

TAIL GROUP

This is made entirely of balsa and is constructed upon the plan. Cover each part separately with tissue in much the same manner as the wing. Aluminum hinges are cemented into position after framework has been completely covered, so that the tissue will be taut. When thoroughly dry, give surface a coat of dope.

FINAL ASSEMBLY

The finish on the other parts of the model will be greatly improved by

(*Concluded on page* 192)

Building a Replica of the BJ-XF-J-2

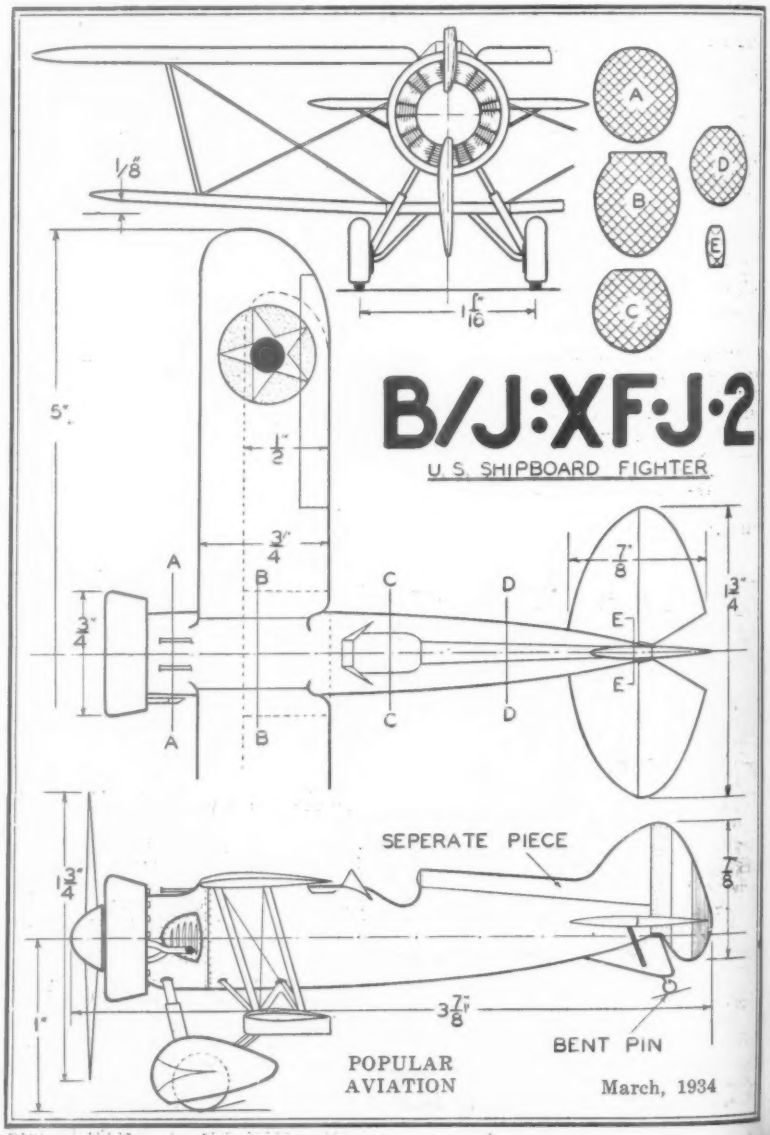
A SCALE replica model of the Berliner-Joyce shipboard fighter, Type XF-J-2 is a most attractive ornament for the living room mantel. The drawings below are made accurately to scale from the original shop drawings so that you can be assured of the authenticity of your model when it is completed.

All of the parts are carved from solid balsa wood if you are fond of easy work, or of some hard wood if you are particular about the finish. Hard woods can be given a smoother surface and the grain is not so distinct as with the more porous balsa. Balsa can be easily carved with an old safety-razor blade, but the hard woods are not so easily handled.

Starting with the fuselage, we see from the sectional views (A, B, C, D) that it starts out circular in form just behind the engine, then verges into an elliptical form between the wings and then returns to the circular form at the rear. The sectional views are lettered to correspond with the points on the fuselage where these sections are supposed to be taken.

The turtle-back on top of the fuselage, the vertical fin and the rudder are in one piece which are made separately and cemented on later. The two halves of the elevator are now cut out and cemented to the fuselage.

It will be seen that the top wing is of the "gull" type with its inner end rounded off and cemented to the top of the fuselage. The lower wing runs through at a distance below the body and is supported by a separate "N" brace running up to the fuselage.



What the Industry is Doing

Latest bulletins from the airplane, engine, equipment manufacturers and dealers boiled down into a nutshell. Contributions to this department are invited.

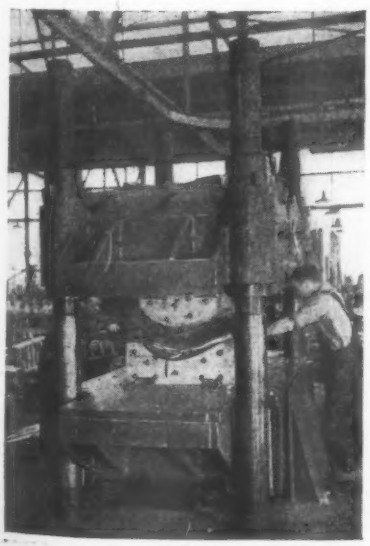
A NEW Beechcraft is announced which sells at a lower price than the previous model. It is equipped with a 225 h.p. engine instead of the original 420 h.p. Whirlwind and is supplied with a retractable landing gear by which at least a part of the original speed is recovered. It has a cruising speed of 145-155 m.p.h.

UNDER THE new $7,500,000 appropriation allotted by the N. I. R. A. to the Navy Bureau of Aeronautics, the Navy will procure 130 new aircraft, amounting to $6,114,391; new aircraft instruments to the amount of $213,250 and aircraft radio equipment amounting to $457,759. Bids will be received for this material within a short time.

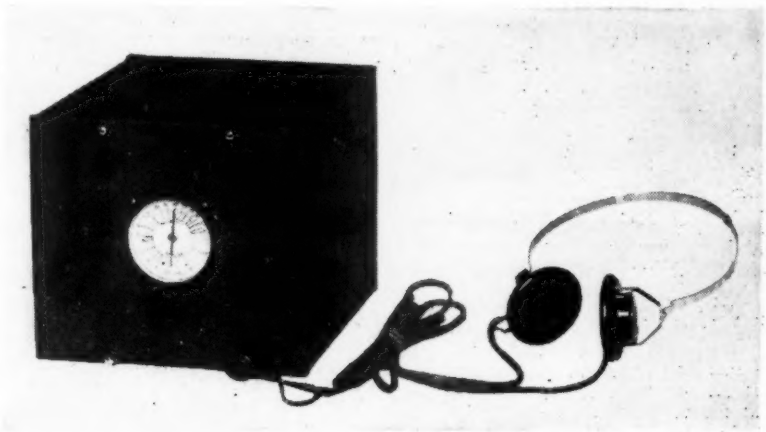
THE SPERRY-CAMMEN oil tester is a new device produced by the Sperry Gyroscope Company, Brooklyn, N. Y. Its purpose is to test the ability of a lubricating oil to cling to and to penetrate metals. After subjecting the oil to a very high speed on a revolving spindle, to measure its clinging power, the droplets are then photographed and analyzed.

BECAUSE OF present conditions, Pitcairn Autogiro Company will suspend manufacturing operations for an indefinite period. It will, however, maintain facilities for servicing the Autogiros now in use.

A COMPLETE aeronautical and automotive engineering service, covering the investigation of new ideas, research, wind-tunnel tests, design and stress analysis is offered by the new engineering firm of Granville, Miller and DeLackner, 101 Park Avenue, New York. Actual construction will be undertaken at the Granville factory, the birth place of the Gee-Bee racer. This group has had an unusually broad experience.



A 700-ton forming press at the Boeing plant.



The Crosley "Air-Roamio" all-wave airplane receiving set for installation on airplanes. It receives on both short and long waves, covering all requirements.

CURTISS-HAWK fighting planes will be produced in China under the supervision of American engineers. Only the engines will be imported from America. This calls for the construction of a $5,000,000 factory in Hankow. The Nanking governments' program calls for a fighting strength of more than 700 planes, and to date, American manufacturers have successfully met British competition in this country.

GASOLINE SERVICE hose lined with Thiokol, a gasoline resistant compound, is now offered by the Raybestos-Manhattan Company, Inc., Passaic, N. J. This gasoline hose, particularly adapted for use at airports, meets the U. S. Army Air Corps requirements.

SENIOR SERIES Bellancas, in which are included the Senior Bellanca Pacemaker and Skyrocket, show many improvements and better performance than the previous models of this series. The Bellanca Senior Skyrockets are produced in two models, the Standard with a 450 h.p. Wasp engine and the De Luxe with a 525 Wasp engine. The Senior Series Pacemaker is powered with either a 420 h.p. Whirlwind or a 400 h.p. Wasp Junior.

MANAGERS OF large airports and airplane manufacturing plants will do well to look into the many advantages of Diesel engines as a source of light and power at low cost. There are several Diesel engines now on the market designed particularly for this purpose, and in general, will produce lighting current at a much lower cost than the public service companies.

A TWO year course in aeronautical engineering, leading to a degree of Bachelor of Science in Engineering, is now being offered by Parks Air College, Parks Airport, East St. Louis, Ill. This course covers Engineering, Aircraft Administration and equivalent executive positions.

SPERRY CORPORATION has established executive headquarters in the RCA Building, New York, N. Y.

MODEL D, Hypressure Jenny is a new cleaning device for aircraft, developed by the Homestead Valve Manufacturing Company, Coraopolis, Pa. It cleans by high pressure steam and chemical spray, the volume of discharge being by means of the nozzle.

THE KINNER Playboy is becoming very popular on the west coast according to reports. This general utility plane, which was described in the February issue of P. A. makes a strong appeal to the private owner.

NORTHWEST AIRWAYS, INC., have ordered a fleet of Lockheed Orion transport planes. They will be used for new high-speed schedules between Minneapolis and Spokane and also between Minneapolis and Chicago. The schedule outlined for the Spokane branch is 7.5 hours for the complete trip, while the time on the Chicago branch will approximate 2.5 hours.

ECRUN VENTS for airplane fuel tanks solve a knotty problem. Their purpose is to equalize the pressure and flow between two or more gasoline tanks, eliminate the vapor lock hazard and improve the feed with the tanks full or nearly empty. This streamlined vent insures the proper flow from dual wing tanks in high wing monoplanes and prevents gasoline from spraying from the vents. They are manufactured by E. Curran, Garden City, L. I., N. Y.

THE AIR-ROAMIO, is a Crosley radio receiver of the superheterodyne type, especially designed for use on aircraft. It covers the aircraft wavebands and also the regular broadcasting bands, all in one instrument. Its total weight is only 9 pounds, 14 ounces, the Crosley Synconode Battery, Power Unit weighing just about the same amount in addition to the weight of the receiver.

Aero-Sportswomen

(*Continued from page* 160)

aerial navigation. And in 1927 she was awarded the first Transport license, and Airplane and Engine mechanics license ever granted to a woman in this country.

When the Omlies established their commercial field they definitely gave up the circus and stunt-flying exhibitions. The devastating Mississippi floods in 1927 gave them an opportunity to demonstrate the worth of aviation to the South. The airplane was the one sure way into that vast flooded area.

The Mid-South planes flew from daylight to dark, patrolling the river with inspectors and photographers in search of levee breaks. From Dorena, Missouri to Vicksburg, Mississippi, a distance of 300 miles, it was the only transportation. They maintained an air mail service between Little Rock and Memphis. It was dangerous work flying land planes over long reaches of water and Phoebe did her turn with the rest.

In the Fourth National Reliability Tour in 1928, competing for the Edsel Ford Trophy, Mrs. Omlie entered her tiny Monocoupe against Eddie Stinson, Frank Hawkes and many other famous flyers in high-powered ships. She was the first woman to enter such a race. The men pilots tried to talk her out of it and failing in this, they insisted that she take a mechanic with her.

"A mechanic?" she retorted. "If I take a mechanic they'll say *he* flew the ship over the bad spots. No, I'll be my own mechanic and I'll fly the ship myself!"

At Marfa, Texas, Mrs. Omlie had a slight accident, landing in a high wind and turning sharply near the hangar, she upset. The damage was slight and no one was injured, but it was the sort of an accident to unnerve a flyer.

"Quitting, Phoebe?" asked the men.

"Not on your life," came the answer. "I'm going through."

"Then for Pete's sake take a mechanic with you," said Stinson, "we don't want any funerals on our hands."

"Sorry Eddie," Phoebe answered, "but your wife is riding with me tomorrow and there won't be any room."

There was no more talk about quitting after that and Mrs. Omlie brought her little red and black plane back to the starting point. Not the winner, it is true, but she did finish the whole gruelling distance—nearly 7000 miles that had taken them to 32 cities and across fifteen states; that had carried them over the deserts of the Southwest and the Rocky Mountains.

When women were first permitted to race under the rules of the Federated Aeronautic Internationale organization in 1929, Mrs. Omlie entered the National Air Races.

She won the CW class race of the Derby from Santa Monica, California to Cleveland, Ohio, that year and the FIRST WOMEN'S AEROL TROPHY race. The next year, in a newly designed ship, she entered and won the Women's National Air Derby from Washington, D. C., to Chicago. And all closed course cabin races of the 1930 races. In 1931 she won the Women's Division *and* the "National Sweepstakes" for both men and women in the National Air Derby from Santa Monica to Cleveland.

"Of course, I am proud to have been chosen for this position in the government," she said, "and I hope that I may always deserve the confidence of the people who made it possible for me to enter this phase of aeronautics.

"I was appointed as Special Assistant for Air Intelligence to help work out plans whereas our industry might come into its own as far as its financial structure is concerned. In the reorganization, the plan is to have *more* flying and *less* regulation."

Anyone with a record like that might be excused for being egotistical but Phoebe Omlie is not. She is as modest as she is courageous.

END.

Traffic Man

(*Continued from page* 166)

"eyes" on the ground, is talking to the pilot. The plane taxies up to the little white line as neatly and accurately as you ever parked a car. I roll the steps up to the cabin door, greet the passengers, assist them to alight and direct them where to go for their baggage.

In a few moments I am back in the office helping in giving out the baggage, replying courteously to their remarks on the service; feasting my eyes on some movie star arriving for a theatrical engagement, answering inane questions of the first-timers; helping someone send a safe-arrival wire to the folks back home and seeing that everyone gets away properly in the cabs ordered for them or in their own private transportation.

Bad weather rolls in on us. I have the unpleasant duty of informing the outgoing passengers that we are cancelling this trip because the weather does not permit safe flying with them. Many of them complain very bitterly, thinking only of the fact that they want to get somewhere in a hurry and not realizing that it is for their own safety that we will not take them. This means a considerable loss in revenue to our line.

If the delay is expected to be only for a couple of hours, the passengers are asked to be ready to leave as soon as the weather breaks. If reports indicate that conditions will remain bad for some time, they are advised to take a train or bus. Of course, in this case I refund their tickets and assist them in obtaining reservations. Frequently, when the passengers are trained, I make arrangements to contact them en route if the weather should break and take them on the remainder of the journey by air. Whenever passengers are delayed by bad weather en route, the larger lines take them to a good hotel and pay for their lodging and meals while they wait to continue their trip by air.

Just a little period of bad weather and the traffic man's duties are doubled and tripled. The traffic department and the Weather Bureau work hand-in-hand. Once upon a time, years ago, mechanical trouble frequently curtailed a flight but such things never happen now on the major airlines.

Every day the traffic man meets with something new or unusual, and as you can see, his job has plenty of variety.

END.

Grafoil
the successful oil
Increase your R.P.M.'s
- Reduces top overhauls
- Eliminates sticky valves
- Dissolves carbon gum
- Creates a self-lubricating surface
- Reduces friction and wear
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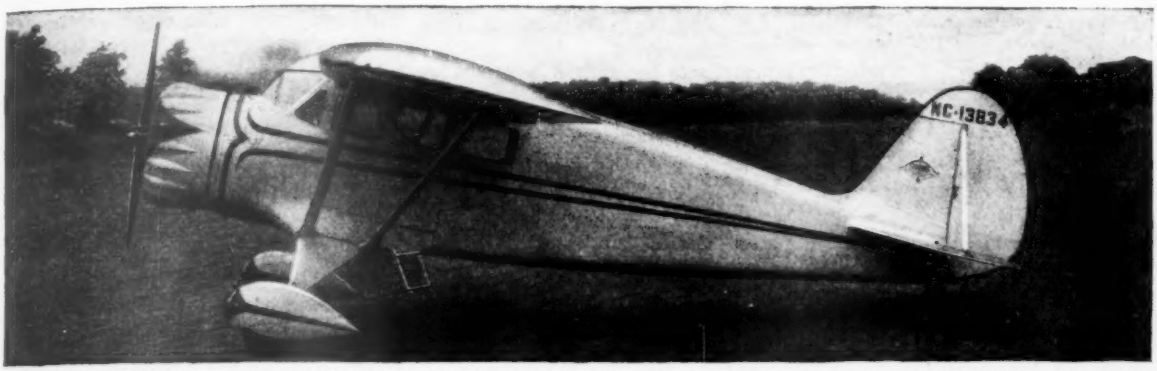
"ASK ANY PILOT"
AMERICA'S OUTSTANDING CHOICE
The WACO Aircraft Company • Troy, Ohio

THE ONLY 4-Passenger Cabin Plane Built to "Airline Transport" Standards



THE NEW STINSON RELIANT FOR 1934 IS AN "AIRLINER" FOR THE BUSINESS MAN AND COMMERCIAL OPERATOR

Leadership

IN SALES

Outstanding value was responsible for the fact that the 1933 Stinson Reliant outsold *ALL MAKES* of two, four, and six-passenger cabin planes *COMBINED* since its introduction in May. Never before was such decided preference shown for any make of plane.

IN SAFETY

With more Stinson Reliants flying in 1933 than any make of four-passenger cabin plane, not a single person was injured and only one Reliant was damaged, in a landing due to heavy fog. This is a tribute to Reliant Flyers and is definite proof of safety.

IN RELIABILITY

By flying more than 60 million miles on single engine and tri-motored planes in the United States, Alaska, South and Central America, Europe, the Philippines and other countries, the Lycoming Transport engine has been proven *MORE RELIABLE* than any motor of its power class.

Now in 1934

A FEW OF THE Airline Transport FEATURES . . .

Selective Gliae . . . Stinson Speed Arresters . . . 225 H. P. Lycoming Transport Motor, mounted in rubber . . . Eclipse Electric Starter . . . 12-Volt Aircraft Storage Battery . . . Adjustable Metal Propeller . . . Full Air Wheels . . . Hydraulic Disc Type Brakes . . . Aerol, air and oil Shock Absorbers . . . Indirectly Lighted Instrument Panel . . . Flight Instruments Mounted in Rubber . . . NACA Motor Cowl . . . Pants or Fenders optional . . . Complete Streamlining . . . "V" Transport Windshield . . . Sun Visor . . . Rear Vision Mirror . . . Safety Glass throughout . . . Dual Controls with Adjustable Control Column . . . Adjustable Pilots Seats and Arm Rest . . . Wide Cabin, Modern Niceties . . . Lighted Baggage Compartment . . . Transport Temperature Regulator . . . 12-Coat High Lustre Finish . . .

Offering many new mechanical features and comforts previously found only in Airline Transport planes, or in planes in the $10,000 price class, the New 1934 Stinson Reliant, four-passenger cabin plane provides the utmost in reliable cross-country transportation, with the safety and precision of the modern Airliner, and at operating costs comparable to motor car travel.

In the New Reliant, Stinson Engineers have secured, as the first essential, *OUTSTANDING RELIABILITY* coupled with positive stability, quick take-off, short-landing ability, sedan comforts, safer vision, 120-mile-an-hour cruising speed, new standards for quietness, heating and ventilation, and lower costs for maintenance and operation.

Compare . . . The 1934 Stinson Reliant With Other Types Before You Buy

Chrome Moly Fusilage and "I" Beam Wing Compression Struts . . . Metal Wing Ribs . . . Chrome Nickel Drag Rods . . . Transport Inspection Openings.

From every standpoint the New 1934 Stinson Reliant is the greatest value ever offered in an American production airplane.

STINSON Aircraft Corp.

Wayne, Mich., U. S. A.

Division of Cord Corporation

WRITE FOR YOUR COPY OF STINSON PLANE NEWS, MAILED FREE POSTPAID

Airy Chat

(*Continued from page 142*)

This course would save a lot of time and money. It would eliminate the continual re-inventing and re-designing of projects long ago abandoned as useless. At the same time, such a study would bring back a lot of the old kinks to light that have had and still have real merit.

* * *

IT WOULD be quite interesting to discover whether the present mania for all-metal construction has proved to be all that has been claimed for it. All-metal ships have advantages, undoubtedly, but at the same time so have other forms of construction.

It has been thoroughly demonstrated that an all-metal ship is a long way from being fire-resistant. The merits of stressed metal skins are questionable because of complete dependence upon thousands of tiny rivets in very thin soft material. And so on, through a long list of unfavorable comparisons, not forgetting the uncertainty of welded joints.

* * *

"YOU CAN bank on Ort," is the title of the most complete catalogue of aviation supplies that we have seen. It is really a text-book or encyclopedia on equipment and should be in the hands of everyone interested in aviation.

Clothing, engines, instruments, tubing, tires, wheels and about everything you ever heard of are described and illustrated in the large pages of this book. And it is only 10 cents. Karl Ort, 704 W. Poplar St., York, Pa., will send it to you for this price.

* * *

YOU WILL find an article in this issue on a subject that has long laid dormant. This is the subject of negative drag or the "Katzmayr Effect" that suggests the possibility of self-propelled planes. This is interesting to ponder upon.

BERNARD H. GREEN, 118 N. Water St., Kent, Ohio, sends in an interesting suggestion for the safety of pilots. It is really a good stunt.

Having in mind air-mail pilot Niff's disaster and the subsequent delay of three days in finding him, an idea occurred to me that I will pass on to you for whatever consideration you may give it.

Would it not be possible for air mail pilots, and others engaged in transcontinental flying, to carry with them a balloon attached to a cylinder carrying a lighter-than-air gas? The gas may be released into the deflated balloon with a valve.

Then, this balloon, three or four feet in diameter, can be painted with the word H-E-L-P which would attract the attention of searchers when allowed to ascend several hundred feet at the end of a cord.

In short, Mr. Green suggests an aerial buoy to mark the scene of the disaster.

* * *

BY THIS time, you will have quite a number of notebook data sheets —twelve to be exact. This means that it will not be long until you will have to get some sort of binder to keep them in. Therefore, we would like to have expressions of opinion on the advisability of P. A. getting out some low-priced loose-leaf covers for these sheets. If you think that such covers would be welcome, write and tell us.

* * *

AND ABOUT that model contest! Boy, what a lot of photographs the judges had to go over. But, the preliminary selections have been made from the photographs and the models will soon be arriving for the final inspection and the election of the lucky winner.

And while we are watchfully waiting, for the models to come in, there is not much to be said on the subject. In the April issue you will get all the dope on the winners. See you next time.

—J. B. R.

AVIATION

The Industry with a Future

There is a demand for men in the aviation industry. Learn to be a

Master Mechanic or
Aeronautical Engineer

New classes forming on February 5th. We can accommodate 20 more students in our day classes and a like number at night.

Send for FREE BOOKLET—register now

Casey Jones School of Aeronautics

558 Broad St. Tel. Mitchell 2-7506 Newark, N. J.

Q & A

(*Continued from page 170*)

per minute. This, of course, is higher than the forward speed of the plane.

* * *

QUESTION:—John Machen, Savannah, Ga. *Can the horsepower of an aviation engine be calculated from the N. A. C. C. formula used for computting the horsepower of an automobile engine, that is, the formula used in getting an automobile licnese?*

Answer:—NO. The commonly used S. A. E. (formerly N. A. C. C.) formula used by most licensing bodies does not even give the actual horsepower of a modern automobile. The average compression pressure of the aviation engine is much higher than that assumed in the S. A. E. formula and the more effective modern valve arrangements give a much higher actual horsepower than indicated by the formula. There is no single simple formula by which the horsepower of an engine can be computed because of the differences in design.

* * *

QUESTION:—A. R. Franklin, Memphis, Tenn. *Why is it that tests on British aviation engines show such consistently superior performance in respect to fuel consumption? Compared with American engines, the difference is very marked.*

Answer:—PROBABLY the main reason, if you are referring to the gasoline consumption in terms of gallons, is the difference between the British Imperial gallon and the United States Standard gallon. The U. S. gallon contains 231 cubic inches while the British Imperial gallon contains 277 cubic inches.

* * *

QUESTION:—Dan C. Loessing, Butte, Mont. *What has become of the tandem wing plane that was so much discussed in past years? Is it entirely out of the running or has it simply been laid aside temporarily?*

Answer:—THERE are many serious objections to a tandem arrangement, structurally, aerodynamically and in arrangement. The performance is always poorer than that of the single wings of which it is composed because the rear wing is in the wash of the forward wing.

With a clear gap between the two wings, of twice the chord, the induced drag on the rear wing is about 1.67 times as great as the drag of a single wing.

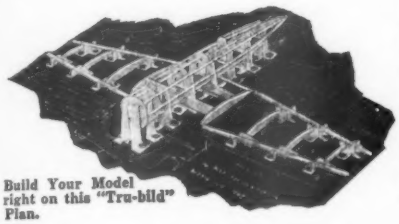
* * *

The principal advantage to be attained by placing the wing in tandem is a better distribution of the passengers or payload. With the wings in tandem, the passengers can be seated along the whole length of a very long body, giving more seating room and better vision.

END.

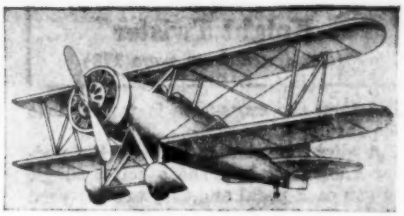
New IDEAL Models

you can build quicker...and that give you real Flying thrills!

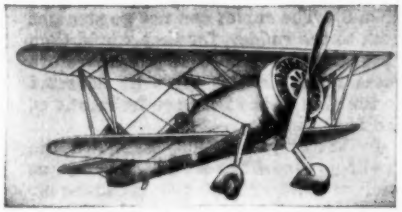


Build Your Model right on this "Tru-bild" Plan.

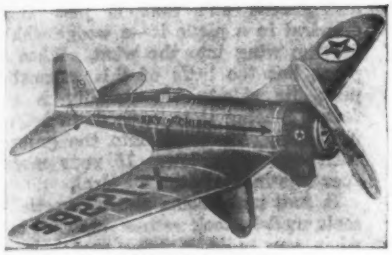
Now you can select from four 16-inch Models in this "Tru-bild" Series; and each one will give you a new idea of how fine and accurate a good Model can be made. This patented "Tru-bild" Plan helps you make Models that are absolutely accurate to plan, without twisted bodies or wings and with every part in perfect alignment. Saves time, takes the hard tedious work out of model building. "Tru-bild" Kits contain all materials and parts for the complete Model, also full-size Plan and Instructions and the patented "Tru-bild" Forming Jigs.



VOUGHT CORSAIR V-65
16 in. "Tru-bild" Model



CURTISS CYCLONE HAWK
16 in. "Tru-bild" Model

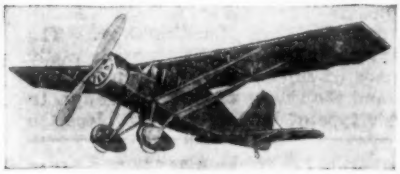


NORTHROP GAMMA
16 in. "Tru-bild" Model

Tru-bild
TRADE MARK REG. U.S. PAT. OFF.

Kits 50c EACH

Plus 10c Postage
(Please do not send Stamps!)

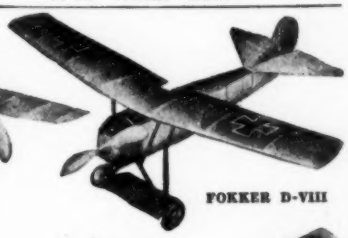


BELLANCA MONOPLANE
16 in. "Tru-bild" Model

BOEING FIGHTER

CURTISS SPARROW HAWK

HEATH PARASOL



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12 and 15 Inch
IDEAL-O-PLANE
Flying Models

Your choice of these ten (10) realistic Models of the most favored planes; every one guaranteed to fly. Kits contain all parts, materials and fittings—everything to complete the Model, including full-size Plan and complete Instructions.

Any 2 Kits for 50c

Plus 10c Postage
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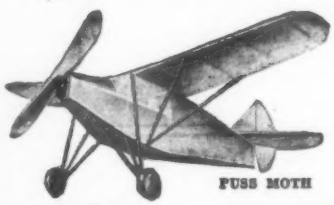
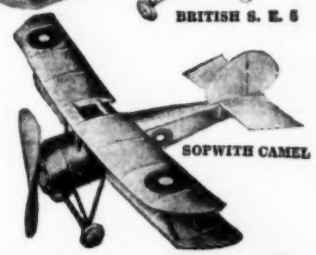
BRITISH S. E. 5



FUSS MOTH

POLISH FIGHTER



SOPWITH CAMEL

MONOCOUPE

Lindbergh's Lockheed Sirius

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Knight Twister

(*Continued from page* 172)

and then the cross-tube is welded into the fuselage.

A slight tension is kept on the rudder cables by two short coil springs, one on each pedal and they are fastened to the front part of the fuselage. Notice that the rudder cables pass through two fiber guides as shown in Detail (No. 6). The cables can not go straight back to the rudder, for they would then pass through the cock-pit, therefore these rudder cables must be deflected to the side of the fuselage by means of the fiber guides.

In Drawing No. 400, is shown the landing-gear of the Knight Twister, as well as a sketch of the landing-gear leg pants and also the wheel fairings.

When this landing-gear is complete and covered with sheet aluminum, it appears to be what is known as a Mono-Strut Type of Landing-Gear. The drawing shows that this type is really made of three struts, heavy enough to stand the shocks of severe landings. In this type of landing-gear we place the shock-absorber under compression instead of tension.

Some types have the shock-absorber in the bottom center of the fuselage and pulls out and down as the wheels come up. Notice, to change a tire, the short axle is pushed out and the whole wheel is dropped out of the fork, as with a motorcycle.

Detail (No. 1) shows the fitting in the fuselage that supports the top end of the shock-absorber. These fittings are made of 16 gauge steel and welded in. Drawing (No. 2) shows the shock-absorber. It shows a wrapped type of rubber shock-absorber. Some of you may wish to design a spring or oleo-type of shock for this ship. It would take less room.

Detail Drawing (No. 3) shows the upper end of the largest strut in the landing-gear that connects with the shock-absorber. Detail Drawing (No. 4) shows the fittings for the landing-gear on the fuselage and also on the front strut of the landing-gear.

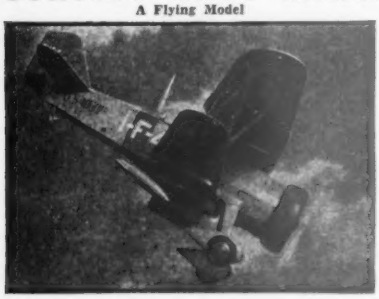
Those fuselage landing-gear fittings are ⅜ inch by 16 gauge tubes welded to the lower longerous and are also reinforced with steel gusset plates to keep these fittings from being torn out of the longerons when a severe landing is made. The ⅜ inch by 16 gauge tube that is welded across the front and rear landing-gear struts is also re-inforced with a strap of steel that is welded to the side of the strut and over the top end.

Notice the partial side view of the fuselage. It shows the landing-gear fittings on the fuselage. The front fitting is on the longeron, but the rear fitting (at station No. 6) is about 3 inches down from the lower fitting. The center-lines of the bolts in both the front fitting and the rear are in line, just the same as the two bolts of two widely separated hinges on a door that may lead to your cellar or private stock.

Being that the rear landing-gear fitting on the fuselage is so far away from the longeron, it must be braced by a tube running in from this fitting to the center of the fuselage at the center front wing fitting.

END.

CURTISS NAVY HAWK
A Flying Model



Span 22⅝". Length 16⅝"
Three-quarter inch scale

The first accurate scale model of this newest Navy Pursuit ship—and what a marvelous model it is with many features and details new to model planes! Dummy balsa bombs; removable auxiliary gas tank; clever, "half pants"; wheels with no visible hubs; detailed Wright motor complete to the radio shielding on the ignition wires; accurate scale prop; radio mast; ingenious dash with instruments covered with celluloid; crash padding just like real plane; dummy throttle and even a fire extinguisher.
All these authentic details are accurately shown on the new super plans that Peerless include in these wonderful kits. You make them yourself and you'll agree that with such drawings you can do things not previously attempted in model building.
Large picture shows the plane diving on an imaginary enemy and dropping its bombs before engaging in actual combat.

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Dealers: Wire for special details and the Peerless Dealer Plan.

PEERLESS MODEL AIRPLANE CO.
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Model Flying

(*Continued from page* 176)

rock from side to side, will skid around in a slight breeze or do a wing-over to the ground. We must remember that a model airplane has no pilot to guide it as with a real plane. The least bit of wind may throw it off its course and if there is not something there to help it back on its course, it keeps slipping until it gets on its side and then it just drops. But a model plane can have an automatic pilot. It is an ingenious arrangement called "dihedral." This is arranging the wing into a "V" form or some modified arrangement of it.

We all know that a wedge is a "V" arangement and that is just what dihedral in a plane is—a wedge which fits the wing into the wind. When a plane has too little of this automatic pilot, its side-to-side stability is affected causing it to come down before it should. To crash into the ground with one wing low. If your model does this increase the dihedral.

It does make some planes, especially scale models, look rather awkward but when you build a flying model, build it for flying rather than looks. If you want a good looking model of a real ship then make it "non-flying" and decorate it with everything conceivable.

Remember this, when building your plane and you will have better luck. Do not make your planes too heavy. A tiny drop of glue is sufficient except in places where the landing gear attaches, etc. A little glue is sufficient because the paper will hold a plane together very nicely. Diagonal braces are hardly ever necessary in a body except where there are so many curves that it will warp unless they are put in.

A good papering job will keep a body from twisting therefore making all diagonal braces in the body unnecessary. Build your planes as light and yet as strong as possible. The lighter the plane, the better the flight and the less motor required and of course, the less chance of breakage.

END.

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Navigation

(*Continued from page* 168)

ground speed and drift, and in most cases, the wind will hold sufficiently steady to keep the plane fairly close to the course for flights up to two or three hundred miles.

One point must be remembered, that is to make full use of special tables, and to do any sort of efficient flying, it is absolutely essential to hold a steady compass course between observations, and to make as constant speed as possible. Continuous changes in course and speed makes it impossible to do accurate dead reckoning.

END.

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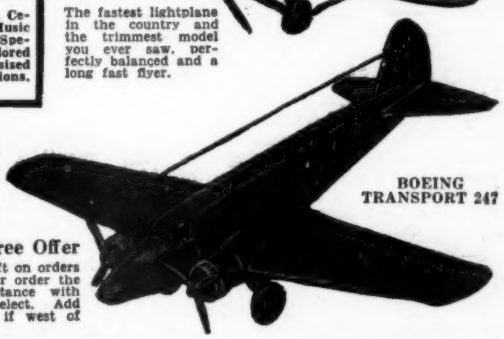

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Dia.	Drag Ring	Open Face	Closed Face
1"	10	15	15
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2"	20	20	20
3"	28	28	28

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1½"	...	...	.10	.10
2½"	...	...	.15	.15
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Coppens

(*Continued from page* 148)

gave him indigestion. Seeing those big yellowish elephantine shapes swinging indolently over the Ypres front got on his nerves. Why must they always be there? Why didn't someone shoot them down? If no one else dared to tackle them, then he must.

It was May, 1918, and already there were rumors the war could not last much longer. Shooting down those *drachens* should certainly help to hasten the end of the bloody conflict in which his beloved Belgium had suffered untold agonies. He had two great desires—destroy balloons and to be alive at the end of the war.

Contrary to the belief that the longest way 'round is the sweetest way home (with your girl friend), Willie Coppens took a short dangerous course to fame. Within four months he had tied the 24 balloon victories of the German Gonterman and the Frenchman Boyan. That was late in August and he won his 34th and 35th victories —both balloons—on October 5th. I like to receive fan letters, but don't write and ask me what he was doing the last five weeks of the war. A man who shot down more balloons than any other pilot, deserved a vacation—if he got it.

Willie Coppens, who resembles our Eddie Rickenbacker with his level brow, keen but kindly eyes, prominent nose and full-lipped mouth, went about making himself a balloon buster extraordinary in an extraordinary manner. The foundation of his remarkable success was built up on a simple premise —do it differently than others do. Use different tactics and strategy. Later he claimed that he owed his life to this firm determination.

He once said: "Most men attack balloons desperately and without hope of victory. Some inexplicable reason has driven them blindly to attack. They know the odds are all against them. If they survive, they are surprised and they say they are lucky. A timid dog will attack a man who shows fear of him and death strikes hard when man invites it to strike. I told myself that I would live and that luck would have nothing to do with it."

Luck never won Willie Coppens a single victory. But amazing courage, determination, a heroic fearlessness and determination to shoot down balloons and not be shot down, won him as many as eight victories in a single month and thrice he shot down three balloons in a single day.

Coppens paid little heed to the air service instructions and orders regarding balloon strafing. But he spent long hours with the commandants and gunners of Allied anti-aircraft batteries. From them he learned what the theory and practice of their defense was. He learned at what heights,, hours, speed and angles it was most difficult for them to defend the Allied balloons. He learned one important factor that was to become a part of his unique strategy —that a balloon was without protection only when the Archie crews were harassed and forced to take to cover, and before the defending pursuit squadrons had time to soar up into the air.

When his strategy was fully developed, Coppens' method was to take off before dawn and fly far to the east behind the German lines. Then, as the sun came up he rode at low altitude in the sun as he went in to attack. No, he made no attempt to attack the balloon first. He nosed his ship down and raked the machine gun pits with a withering Vickers fire. Again and again he would sweep over the *drachen* station, sending down his leaden hail until the gunners were forced to flee to dugouts and buildings in fear of their lives. For a brief interval the bag was wholly without protection.

And in that brief period Coppens would attack. With a sudden thrust he was up and at the *drachen*.

He would send a burst of incendiary bullets into it and veer off sharply to get away before flames could leap out of it and lick at his ship. Then, with full open throttle, he was away before protecting Albatrosses and Fokkers could arrive on the scene.

Again, late in the afternoon, he would repeat the attack. This time he would come out of the west riding the glare of the setting sun.

In the Belgian Air Service a pilot had to be officially accredited with seven victories before he was recognized as an Ace. Coppens shot down five balloons and one plane during the month of May and in June became an Ace. In June he sent six more balloons down; in July he got eight balloons and his second and last plane. He scorned shooting down an enemy pilot. It meant only one plane and one pilot. To shoot down a balloon meant protecting the movements of regiments armies. One balloon down meant that the German generals were without eyes for hours until another balloon could take its place. And when it did, Coppens promptly destroyed it. In August the Belgian balloon buster got seven more, four in September and finished with three in October.

After attacking, Coppens never zoomed up for altitude. There he would again become a target for the larger anti-aircraft guns. The guns, set for a high angle of fire, would have to be re-ranged before the gunners could fire. By that time Coppens had hedgehopped out of range.

One of Coppens most spectacular methods of shooting a "sausage" down was with rockets which, long before 1918, were obsolete. He found that exploding bullets took a long time to fire a balloon. An incendiary bullet would explode inside a balloon, but the gas could not ignite until oxygen in the air had seeped in. This slow firing, Coppens believed, was the direct result in the death of many Allied balloon attackers who were killed in their second and useless attack on a balloon which they had already succeeded in giving a wrecking burst. He brought down six balloons with rockets.

Willie Coppens wanted to shoot those German *drachens* down from the Ypres front. He did. He wanted to be alive when the war ended. He was.

END.

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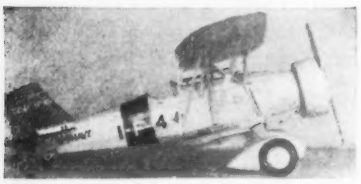

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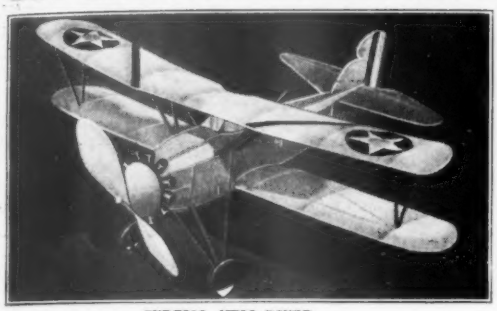

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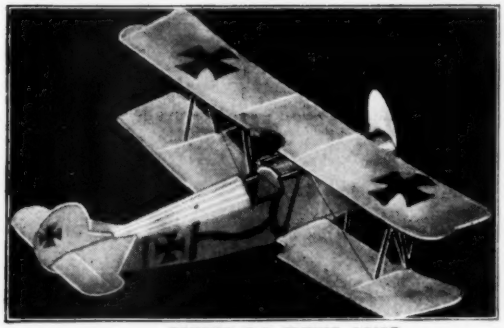

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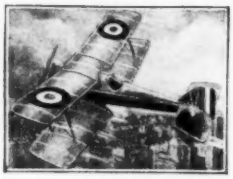

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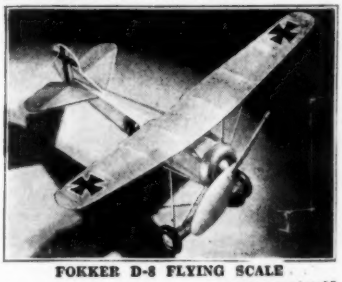

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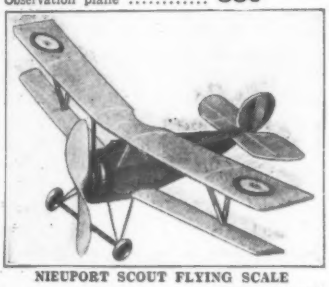

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HERE'S good advice! Now is the time to buy and build the famous BPA Models—before prices go shooting skyward! Make your choice from the marvelous line of kits shown on this page—each is a de luxe BPA Flying Scale Model Kit—each 12" wing span—the kind that the best model builders prefer! BPA stands for the highest quality of kits and supplies at the fairest, lowest prices. You get quick shipping service, and money back or exchange privileges if you are not satisfied!

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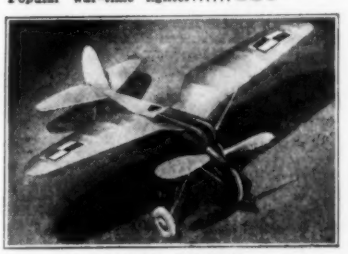

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Goshawk

(*Continued from page* 182)

giving them 3 or 4 coats of banana liquid, so that they will have a smooth and glossy finish.

Cement all cabane or center section struts in position to receive upper wing panel. Cement wing panels to these struts making sure you have the proper alignment. The lower wing panels are now cemented to the two cross braces, which are cemented to the two bottom longerons.

Block the tips up properly so that they have the correct incidence and 2° dihedral angle at the tips. After this has been completed, the end struts are cemented in their proper locations. Use a needle and thread in installing the flying, landing and bracing wires.

PROPELLER

Many model builders require two types of propellers. One for flying and one for display purposes. We have correctly shown on the plan how to construct both of these types. The flying propeller is very simple to construct.

A propeller with a broader face than the scale propeller is necessary in order to contact a sufficient amount of air to drive the model and to hold down the speed of the rubber motor. Another important item is the bearing which must allow the propeller shaft to turn freely and yet must be tight enough to prevent "wabbling" or vibration.

FLYING THE MODEL

Where possible, it is best to give the model a gliding test over tall weeds before attempting to fly it with the motor. When properly balanced, it should glide steadily without diving or stalling.

END.

Assemble This

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MEAD GLIDERS

Dept. E-3, 12 S. Market St., Chicago, Ill.

Landing

(*Continued from page* 156)

airplane consisted only of the radio compass, flight indicator, (gyro horizon), turn indicator (gyro compass), sensitive altimeter, airspeed indicator, and the usual engine instruments. For the ground installation a small transmitter was used at the end of the landing runway in the vicinity of the boundary, or a little beyond, a similar transmitter was located one or two miles farther away in prolongation of a line drawn through a point in the landing area and the transmitter near the boundary of the area."

An additional device is an ultra-high frequency boundary marker, a low range transmitter set just inside the field's boundary line. These devices, all portable, are lined up so that they head toward the field and into the wind, the same direction in which an airplane should be landed.

The sonic altimeter which registers its height above the ground when used in an airplane was one of the devices tested but abandoned in favor of the sensitive pressure altimeter, as the sonic device weighed 35 pounds and required too much concentration in its use at a time when the senses were needed for a number of other things.

LET us imagine an Army pilot on an extended avigation flight nearing an airdrome and encountering fog which, from the radio weather reports, he learns is blanketing his destination in dense fog to a height of two thousand feet. The pilot switches on his transmitter and picks up his microphone.

"Patterson Field, Patterson Field, this is Army plane O-38, number 31-437, over Columbus, Ohio, Lieutenant Blank with one passenger, from Bolling Field to Patterson. What are weather conditions there? May I land there? Answer, please." He switches on to "Receive." In a moment the reply comes back.

"Army plane 31-437, Lieutenant Blank, this is Patterson Field. Dense fog. Come in blind, our apparatus O.K. Here are weather conditions—East wind 8 miles, field firm and dry, barometer two nine point eight seven. Repeat."

The pilot repeats the data to insure the correctness of his reception, then turns to the sensitive altimeter on the instrument board and sees that when he left Washington it had been set at sealevel with the barometer at 29.95 inches. His map shows his destination as 830 feet above sea level. He sets back the altimeter these 830 feet and *further* adjusts it for the difference in *barometric pressure*. The altimeter is now set so that it should read zero when he had landed at Patterson Field.

His map also shows a ridge of ground between Columbus and Dayton and he takes care that he flies high enough to clear all possible hills and other obstructions. A few miles outside of Columbus he sees the fog, damp looking wisps of steam near the ground, which becomes thicker and higher as he flies on until soon he is enveloped in its clammy depths, or rather, heights, with beads of water dripping off his struts. He is flying toward the radio range beacon at Wright Field, the long letter "T" droning in his ears and assuring him that he is on the proper course.

When the loudness of this range signal and the clock also, tell him that he is within several miles of the landing area, he turns the receiver to the wavelength of the nearest portable radio landing station and watches his radio compass carefully. When he is headed for the station the needle on this instrument points to zero. (see Fig. 1).

He is now at position (A), losing altitude rapidly until he is within 200 feet of the ground. He passes over station No. 1, or position B, Fig. 1, and his radio compass needle jerks to one side. He then tunes in on station No. 2, by a mere flip of a switch and flies toward that station, crosses it and makes an easy 180 degree turn to head his airplane back to the field along the desired direction, into the wind.

He is now coming in to land, his artificial horizon guiding his hand at the stick to maintain the airplane level and the gyro and radio compasses telling him when he is "headed for home." (Position C, Figs. 1 and 2.)

At "D", (Fig. 2) the needle of his

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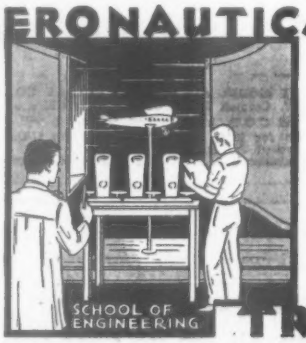

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radio compass twitches and he quickly switches it on to the wavelength of station No. 1. He should now be about 500 feet above the ground, according to his sensitive altimeter and he retards or advances the throttle until his tachometer reads 1300 r.p.m. He is descending now, (Position E, Figs. 1 and 2) and the needle of the altimeter is slowly working toward zero, with the radio compass needle reading zero if the pilot is properly heading into the wind, toward station No. 1. Again the needle twitches and his altimeter shows him 150 feet off the ground.

NOW comes the actual operation of landing. The throttle is cut to about 1,000 r.p.m. and the nose of the airplane pulled up a bit until the airspeed indicator shows a speed of about 60 miles an hour. (We are assuming an observation type airplane, normally loaded except for an almost depleted fuel supply and hence an airplane considerably lightened.)

The fog may be thin enough to give the pilot a view of the ground but he "sticks to his needles" and keeps his eyes glued on the instrument board before him. (Fig. 3) A bulls-eye flashes on one of the dials, he has passed the edge of the landing field itself. He is losing altitude at the rate of 400 feet per minute, according to the climb indicator and his nose is still up and the airplane almost in landing position, with just a few miles an hour more speed than stalling speed (Fig. 3.) A bump and perhaps a bounce or two—perhaps not—for many perfect landings have thus been made.

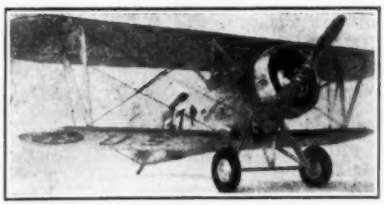
He is on the ground inside the landing area, perhaps the fog is still so thick that he cannot see the hangar line, but *must use his instruments to taxi there!* That, too, has been done in the past and will be done again in the future.

And speaking of the future, "I imagine the next thing to do is try it out in a two or three-ship formation in an actual fog," stated Captain Hegenberger to the author. "Of course, the cockpit hoods will not be used, they are nothing more than substitute for fog anyway, but the fog must be *thin* enough to allow the wing men to see their leader. When he turns, they turn; when he cuts his gun and pulls up his nose, they do likewise, and with him float down to a landing. The leader must observe the same precautions he would in an ordinary formation flight and landing, not to make any maneuver or change in speed too abruptly and land far enough out on the field so that the wing men do not stall down on the boundary fence behind him."

"Captain 'Joe' Cannon, the pursuit instructor at the Advanced Flying School, Kelly Field, when I was there as a student, used to lead a three-ship formation into the densest clouds, himself in the leading ship which was equipped for fog flying," remarked a young Army flyer recently graduated from Kelly Field. "The other two ships were piloted by students with less than 200 hours flying time to their credit. Thus, did the Army solve the blind landing problem—somewhat complicated, perhaps but entirely practicable and workable.

END.

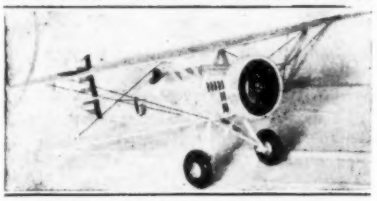
Boeing F4B4 Pursuit



22½" Span, Weight 2¼ oz., Flies 750 Feet

Set contains 3" celluloid motor, aluminum drag ring and motor plate, ribs and formers printed on balsa, celluloid wheels, silver discs, wing, rudder, Army and fuselage insignia, semi-finished prop., Yellow and silver dope, glue, drawing and all materials. Const. Set, P.P. ..... $ 2.95

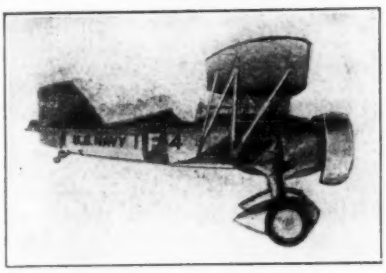
Curtiss Sea Hawk P3A



24" Span, Weight 1¾ oz., Flies 900 Feet

Set includes 3" celluloid motor, aluminum motor plate and drag ring, balloon celluloid wheels with plate discs, printed instrument board, fuselage, wing and rudder insignia, aluminum pilot's seat, dope, glue, drawing and all materials. Const. Set $ 2.50
Same Set with 3¾" Scale celluloid Hornet Motor without cowl. Postpaid ..... $ 2.95

Curtiss Goshawk F11-C2



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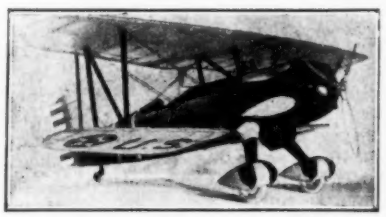

24" Span, Weight 2¼ oz., Flies 800 Feet

The strongest and most perfect model of the P6E on the market, has squadron insignia on pants and fuselage, metal exhaust pipes, aluminum wheels, 2 color dopes, all parts printed on balsa, printed instrument board, semi scale, Fibre prop. Const. Set Complete, Postpaid ..... $ 2.50

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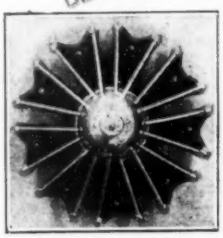

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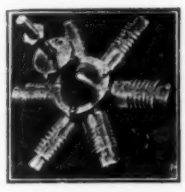

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European Lines

(*Continued from page* 146)

with the mother country. So, in 1927, an Egypt to India route was opened. In 1929, a London to Egypt link completed the service through to India.

Imperial Airways carries the bulk of the traffic on the most popular route in Europe, the London-Paris route, a distance of 225 miles. Part of this is over the English Channel. Its only competitor is the French *Air-Union* and it regularly carries more than twice as many passengers as does *Air-Union* on the same route. The British planes on this route are the biggest and finest on any European service. They are the Handley-Page "Heracles" type, powered by 4 Bristol Jupiter 9-cylinder engines developing a total of 2200 h.p. Pay-load capacity is 7750 pounds. Accomodations are provided for 38 passengers and a crew of four.

They are slow, as are all European planes with the few exceptions where American equipment is allowed to be used. They cruise at only 105 m.p.h. What they lack in speed, however, is made up in comfort. They are easier riding and much more quiet than anything I have seen in this country. The interiors are luxuriously appointed, similar to a Club car on one of our Pullmans. The walls are beautifully inlaid with wood and arm-chairs are deeply upholstered. There is plenty of room to walk around.

The service is very well managed. The fare, $22.50 (at par), includes transportation to and from the center of London and Paris to Croydon and Le Bourget. Four trips are made in each direction daily. Hot meals are served en route. The stewards serve breakfast, luncheon, tea, of a 7-course dinner according to the time of the flight. There is a built in bar open at all times.

Everything about the service is in keeping with the English standard of comfort. This is the one point on which I think Imperial Airways is superior to the American transport operators. But that applies to Imperial Airways only—not to the other European operators.

While London-Paris is the company's heavy-traffic route, its most interesting routes are those to India and South Africa, 5500 and 8400 miles long, respectively.

The England-India service has been maintained weekly since 1929. The route passes through 10 countries, where eight different languages are spoken, and nine different currencies used. The trip, which is conducted very leisurely for an air service, takes 6½ days. The fastest boat and train combination takes 17 days. There is no night flying on the trip. Passengers eat dinner on land and stay overnight at the best hotels along the route. The fare, which includes hotel accomodations, all meals and even tips, is at present $475 (at par). The letter rate is 12 cents per ½ ounce.

Three different types of planes are used on the three divisions of the route. Passengers fly from London to Paris in a "Heracles," described above. At present the next link, Paris to Brindisi, Italy, is accomplished by rail, the Italian Government having now prohibited British planes from flying over Italy. From Brindisi to Cairo over the Mediterranean is about 1800 miles where the company uses Handley-Page "Scipio" flying-boats. They have the same engine plant as the "Heracles" but are smaller and carry only 15 passengers and crew of four. From Egypt to India, the company uses "Hannibals," powered by four motors with a total of 1960 h.p. and carrying 24 passengers. Each one of the ships used on the three divisions is designed to operate under the particular conditions encountered along its route.

The England to South Africa route, London-Cape Town, which has been open since early in 1932, is considerably longer—8400 miles. The trip is made in 11 days but it is probable that this will be cut to 9 days very shortly. This would be 8 days less than the fastest boat takes. The route is the same as that for the England-India flight as far as Cairo. There the planes turn South and fly over the heart of the African jungle. The overnight stopping-places are in some instances mere clearings as there are few towns or cities along the route.

Handley-Page has designed a special "Atalanta" plane for use on the South African service. These machines are powered by four Armstrong-Siddeley Double Mongoose 10-cylinder engines developing a total of 1360 h.p. Cruising speed is 120 m.p.h. They carry 9 passengers and a crew of four.

The inclusive fare is $650 (at par). Letters are taken at the rate of 25 cents per ½ ounce. The service is weekly and as yet the mail has never arrived late in Cape Town, nor has there been an accident since the route was opened.

Before closing, a word as to European airports. The "Big Three" are Croydon, 45 minutes from London; Le Bourget, 45 minutes from the center of Paris and Tempelhof, 10 minutes from the heart of Berlin. Croydon boasts a good restaurant and hotel accomodations for early travellers but the facilities for handling planes are no better than in this country. Le Bourget has no right to be classed with the other two. It is much smaller, is crowded at all times with military planes which are kept there and has a bad layout of buildings and hangars. Except for these three, there is nothing in any other city of Western Europe worthy of the name "airport." They are only landing-fields and there are very few of those.

END.

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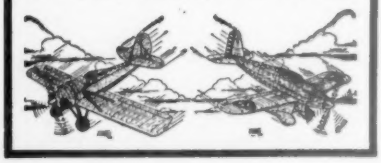

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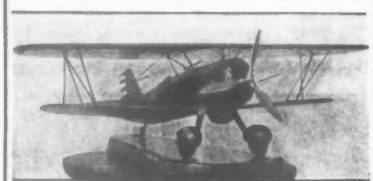

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The APRIL ISSUE

In the April issue, as in past issues, POPULAR AVIATION will present only the best and most interesting articles on the subject of aviation. The April issue will contain all of the departments and features that have proved so popular in the past with additional material that will meet your approval.

First, among the new features, we will present the first article of a series of articles by Alexander Klemin, the internationally recognized authority on aeronautical engineering and the Director of the Guggenheim Aeronautical Foundation. You cannot afford to miss these authentic and masterly treatises.

And then, Glenn D. Angle will be back with us in April, with further remarks on engine construction and design. As you will remember, his previous articles were the last word on the subject, and the coming articles will be fully up to his previous standards.

But—the articles will not all be of the technical type. There will be some fine yarns of general interest, such as a war story by Carl B. Ogilvie, a cow-pasture comedy by William L. Hopson, and so on with a number of other stories. Don't miss the April issue, and to make certain that you receive this number, send in your subscription TODAY.

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AIRPLANES

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BRAND NEW OUTBOARD RACING BOAT, Class B. Lightplane Air-wheels. Want lightplane engine, plane parts, etc.—Charles Lackey, Pottstown, Penn.

PRIMARY GLIDER in good flying condition. Will trade for equal value in late motorcycle, oxy-acetylene welding outfit, small screw cutting lathe, or garage tools.—Stanley B. Morgan, R. F. D. No. 4, Eaton Rapids, Mich.

RHON GLIDER, licensed 1932, built under inspector's supervision. Used very little. Good paint job. Will trade for light car, sail boat, aero engine or Ford A conversion.—John Hladik, Box 188, Litchfield, Conn.

REBUILT HEATH PARASOL with new Anzani 35 h.p. motor, 20 x 4 wheels, cowl tanks, streamlined for speed. Complete less prop. Not flown since major overhaul. Will trade for good light car, cash, or what have you?—Smith McKann, 215 E. 39th St., Norfolk, Va.

FOR SALE OR EXCHANGE—Travel Air, 2000 for small lightplane, 2 place.—John Krinker, Hotel De Soto, Savannah, Ga.

AIRPLANE WANTED, preferably a 1 or 2-place job, must be air worthy and complete. Might consider slight crackup. Have short wave radiophone transmitter and receiver, 16 mm. Eastman movie camera and projector, Bench lathe, etc. Might pay cash difference.—E. J. Geil, E. 1511 3rd Ave., Spokane, Wash.

METAL-WORKING LATHE, new, Compound crosslide 6 inch swing, 24 inch overall length, weight 22 pounds. Want lightplane motor, plane parts.—Charles Lackey, Cherry St., Pottstown, Penn.

YOUNG MAN, 20, will go anywhere, at any time, to do work of any kind, in exchange for a used airplane in good flying condition, and two or three dollars a week salary to live on. A fair mechanic and trouble-shooter.—B. Fisher, 1348 Capital Ave., Des Moines, Iowa.

AIRPLANE WANTED. A Jenny, Standard in good condition. Covering may need repairs, patches. Need also Avco 504-K Parts LeRhone 110 parts, Jenny parts. Also want anything connected with wartime, postwar aircraft. LeRhone assembly book wanted.—Bill Rhode, Renegade Aeroplane & Motor Co., Teaneck, New Jersey.

I HAVE a Curtiss OXX motor complete, a 2 cylinder opposed air-cooled motor incomplete, a twelve foot 2 passenger step boat with steering wheel, clock, tachometer remote control and eltoquad. Want lightplane, radial motor or what have you.—Milton Schultz, 1108 Michigan Ave., Sheboygan, Wisconsin.

HEATH-HENDERCON Conversion complete with propeller. Wanted auto-radio, electric motors or what have you?—Emil E. Fachon, Rehobath, Mass.

A CHARGE of two cents per word will now be made for all advertisements entered in the Barter and Exchange columns. Please enclose remittance on this basis when submitting copy.

POPULAR AVIATION
608 S. Dearborn St.,
Chicago, Ill.

SZEKELY 45, Continental A. 40 or Aeromarian A. R. 3. Will trade or pay cash, also have motorcycle to trade.—William Sweet, 72 North Street, Methuen, Mass.

CASH OR TRADE Waco ten, licensed Sept. 15, 1933. Trade for late model car, home or business.—Box 217, Hill City, S. D.

TWO OX EAGLEROCK, now in state of repair. Incomplete J. I. Standard and parts. OX and Hall Scott props. Eaglerock parts, dope and Dinner. OX cyl. regrinding and reseating. Trade for garage equipment, light car, cracked airplanes, lower wing or spars and riles for Eaglerock. Consider anything in aeronautical line.—Peter Bryn, Dazey, N. Dak.

SPORTPLANE WANTED. Trade 1927 Ford coupe. New paint and tires, ruxtell heater, bumpers, excellent motor. Also have $80 trumpet cornet.—Bud Sternberg, R. F. D. 3, Box 455, Seattle, Wash.

1929 OX WACO to trade on air-cooled job. Pay cash difference. Want licensed job. Not over four place. My Waco is in good condition. Prefer closed plane.—Ted Rousseau, La Plant, South Dakota.

I HAVE a cracked up Stinson SM 2 Four Place plane which I wish to trade for a Radial motor of 150 to 225 h.p.—Chas. Abbott, Canton, Minn.

MEADE PRIMARY GLIDER, A-1 condition. Test hopped only a few flights. Will sacrifice cash or motor. Must be 40 h.p. or above, also tools, welding outfit, lathe, grinder, drill or any power tool. Will also consider crack ship and radio.—Willard Beadle, Route 2, Warland, Wyo.

WANTED—Lightplane, two place. Have 1926 Buick, 1930 Ford, 2 Maytags, 1 cycle motor, some cash.—John C. Roddy, Nebraska City, Nebraska.

WILL TRADE WACO Ten crackup for lightplane or what have you?—P. A. Frazee, Bucyrus, Ohio.

OX5 WACO 10—Around 250 hours since new on ship and engine. Fuselage was painted over dafe and ringed. Otherwise ship appears new. I value it at $495. What have you to trade? —Harold L. Cox, R. 2, Waterville, Kans.

OXX6 CHALLENGER C-2, 250 hours total time. 10 hours since overhauled. Has all instruments, 3-passenger, like new. Will trade for cruiser, Katch, Yawl or cash difference. Monprep or Monocoupe or Aeronca.—Jack Remsen, Jr., 769 Hunterdon St., Newark, N. J.

WANTED in trade a light 2 or 3 place plane in good condition, such as an Aeronca or an Arrow. Sport plane. Will exchange 13½ acres of land near Seattle, Wash., partly improved. Ideal location for a chicken ranch. Will trade a small piece of ground in the town of The Pas, Manitoba, Canada, for an automatic, either Colt or Savage.—J. N. Anderson, Box 482, Brawley, Calif.

AIRPLANE WANTED. Will trade a glider, revolver, 5 h.p. engine, 1 h.p. engine, Ford engine, all electric 16 mm. movie machine. Flying condition or slightly cracked.—Herbert DeWeese, Jr., Collbran, Colorado.

LICENSED LIGHTPLANE WANTED. I have a 1929 Ford Roadster in perfect condition. Also a Cessna primary glider with shock cord.—Edward J. Lambert, 821 E. Willard St., Philadelphia, Pa.

AIRPLANE WANTED. Two or three place, in good condition. Prefer Curtiss Junior, Eaglet, Aeronca or similar ships.—Joseph Kacher, 181 7th St., Barberton, Ohio.

WACO 10, Licensed, Millerized. Waco red fuselage with cream wings, compass, air-speed, bank and turn. Motor, twins 1400 on blocks, also OXX6 Millerized motor with Hartzell propeller and hub for same. Some new OX5 parts. Will trade all for Challenger Robin or similar 3 or 4 place job.—R. W. Bieyle, 314 Broadway, Greenville, Ohio.

1930 5 PASSENGER Cadilac Town Sedan, custom built, radio, 2 heaters, wire wheels, car like new, want 3 place open ship. Some cash.—Joe Dabroski, 1001 Charles St., Rockford, Ill.

WILL TRADE a 1933, 74 Harley Davison motorcycle with lots of extras for a lightplane. Must be licensed or could be.—D. E. Illian, 3020 Main, Parsons, Kans.

I HAVE one place wood fuselage with controls, monoplane wings with ailerons, empennage, all uncovered twin buckles, etc. 5 watt fone Xmitter, microfone control, microfone. Passes Dep. of Comm. requirements. Radio receivers, Harley "61" motorcycle, Harley "37" opposed motorcycle, rebuilt, new rings; rollers, bushings, pins, etc. Many other good articles. I want 1 or 2 place lightplane with good motor in flying condition. Licensed or unlicensed or what have you that will fly? T. M. Scout or Jennies considered or 4 cylinder Midget car in good condition. Or late Harley single motorcycle or offers, all answered.—Leonard H. Miller, Coon Rapids, Iowa.

ENGINES AND ACCESSORIES

WANTED—Anything in air-cooled engines up to 35 h.p. outboard motors or hulls. Have in trade 1928 Sterns Knight, 6 cyl. coach, Durant 4, less body, 5 tube dry cell radio, etc.—A. Punzavitz, 116 Steamboard Road, Great Neck, L. I., N. Y.

WANTED—A 110 volt, 60 cycle Power Pact for electric radio. Have Miller carbureter, streamline wires, control assembly, Clark Y ribs, many other parts.—Cletus Jerger, 512 Clinton St., Martins Ferry, Ohio.

LeBLOND MOTOR—90 h.p. radial with Scintilla's and Stromberg carbureter, 2 new props $175.00. Now installed in identified KariKeen Cabin, Ship Instrument $50. Will accept car of equal value either item.—C. E. Schmoyer, Macungie, R. F. D., Pa.

WANTED—Fuselage steel preferred, also split type landing gear, air wheels for Air Camper. For what? State particulars first letter.—Thos. Spaulding, Montpelier, Ind.

WANTED—Crankshaft for Aeronca E-107 motor (not E-107A). Will trade pair of Aeronca cylinders and pistons or Heath tail group.—A. C. Fowler, R. D. No. 1, Hurricane, W. Va.

AIRPLANE ENGINE Cylinders, air-cooled, 4.41 bore. Complete with pistons, valves and spark plugs. Will trade for aviation books or magazines.—A. Jones, Schertz, Texas.

AIR-COOLED, 9 cylinder airplane motor, 110 h.p. LeRhone, new. Complete with mag, carb., hub, spark plugs and everything ready to run. Will swap for a small engine.—A. Jones, Schertz, Texas.

TIRES—26 x 4 and 5.00, 4 tubes 5.00, 4 wheels

26 x 4, used but in good condition. I will trade all for aviation information.—A. Jones, Schertz, Texas.

WANTED—Velie motor parts. Cylinder heads with or without cylinder barrel, and pistons. What have you and what do you want?—B. O. Burnette, Claremore, Okla.

HAVE two Heath-Henderson motors. Both perfect, and one Heath fuselage, also set for instruments. What am I offered?—Chas. W. Swartzell, 1602 E. Michigan City, Indiana.

WANTED—Airplane parts for room decorations.—Phillip Banks, Clark, S. D.

LEONARD PRIMARY TRAINING GLIDER needing tail and needing repairs to trade for a twin motorcycle or outboard motor, reasonably near.—C. J. Spencer, Kingston, Mich.

ONE TEN and one half foot racing Class A hydroplane, brand new. Want good 12 h.p. outboard motor, or 1½ to 3 h.p. outboard, 1930 Harley, or what have you?—James Swan, 613 Roxboro Place. N. W., Washington, D. C.

WILL TRADE a Smith motorwheel engine for a pair of 20 x 2 tires or fenders.—R. Manka, Lamar, Colo.

TO TRADE—Twin Excelsior motor, A-1 shape; 3 Maytag motors, one mag. equipped; 3 twin Indian magnetos. New American Bosch single mag., cylinder, piston, pin and rod for Smith motor wheel engine. ¼ h.p. electric motor. 1/16 h.p. motor. New Scanlan No. 500 power transformer. All sizes variable condensers, audio transformers, chockers, and resistances. Need typewriter, helmet, goggles, flying suit, Henderson motor parts or what have you? Send for list.—Robert Cottom, 620 East Sixth St., Cherryvale, Kans.

GYPSY MOTH MOTOR, and parts, all instruments, wings and fuselage for biplane. Will trade for most anything.—Geo. Berghoff, Wellsburg, W. Va.

GATES R. S. V. Fuselage and complete tailgroup of a 3 place convertible mono-byplane. Cabane struts, gas tank. Perfect condition. Worth $25.00. Will take in trade OX-5, LeRhone. Clerget engines, typewriter, what have you? Also Renard mount, LeRhone 80 parts.—Bill Rhode, 112 Circle Drive, Teaneck, N. J.

GLIDER supplies to trade for aviation course. —A Jones, Schertz, Texas.

On the Coast

(*Continued from page 152*)

Skywriting was little known in those days and Smith did pioneering work along that line. He performed all his daylight acrobatics with smoke streamers on his wing tips and several times wrote words in the sky. Being an expert in the field of fireworks, displays of that sort afforded him information as to methods of securing dazzling colored effects.

Nothing in those times was known about blind flying as it is known today. Yet time after time this young pilot took his ship off at night, climbed up through the fog and stunted above the fog layer with his fireworks blazing away. His uncanny ability and flying sense must have been developed to a high degree to avoid a bad landing in the dark for his only landmarks were the high buildings and the glare of lights.

His method of spinning on exhibitions was much as same as today. He would roll the ship from a steep dive and pull up the nose. The ship would begin to rotate rapidly with the power cut off. He would make five turns of a spin and then pull out in a steep dive.

With his contract terminated, he sailed for Japan where he gave thrilling exhibitions for the Emperor, was decorated and given a big ovation in his honor. He suffered his worst crash in the island kingdom and finally came back to the states where he became an instructor in the Aviation Section of the U. S. Army. After that he was in the materiel division at the old McCook Field in the capacity of engineer. Later on, he flew DH4's for the postoffice and finally died in a crash while making a forced landing in a storm.

The names of these "early birds" are fast disappearing from our memories —and soon will be just a matter of record. If there is an airmans' Valhalla you'll find them there—perhaps in a dog fight with the Valkyries or doing slow rolls around the pearly gates.

END.

U. S. AIR CORPS

Takes in this year 600 unmarried men between the ages of 20 and 28 and gives them free FLYING TRAINING consisting of 200 SOLO HOURS, including cross country and night flying. Gives them Special Uniforms, Traveling Expenses, and pays each man $75 a month. The course takes one year. The Training costs Absolutely Nothing. Let us tell You How to get In: Information about System, Leave, and Actual Life at the New $10,000,000 Field. Send your Name. Hand postman $1 and postage when information arrives. It is COMPLETE. Nothing else to buy.

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Guarantee yourself a good future position as a Pilot or Airplane Mechanic. Do so by enrolling at the Lincoln Airplane and Flying School. On the ground and in the air . . . Lincoln graduates get the best positions. Because Lincoln Government Licensed Instructors know how to train you for the big pay jobs in aviation. Just as they have trained many Lincoln graduates who write like this:

C. L. CURRIER Has written: " . . . Since I completed my training at the Lincoln School I have been employed continuously as pilot. My salary . . . is $400 a month. Lincoln trained pilots are preferred because of the character of the training they receive."

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COMPLETE TRAINING—ALL KINDS OF FLYING—You miss nothing at Lincoln that will make you a successful Pilot or Mechanic. Unexcelled Lincoln training includes both **blind flying by instrument** and **cross country flying** in high wing and low wing monoplanes, biplanes, cabin planes, etc. Also acrobatics, master mechanics, airplane and engine course.

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Right now the Government is spending millions of dollars to promote commercial aviation, to build hundreds of new airports and thousands of new airplanes. This will mean thousands of new jobs. Now is the time and Lincoln is the place for you to train yourself for one of these good pay jobs in aviation. Write now!

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Act now—get in on the ground floor in the world's fastest growing industry. Remember the government is spending millions now to provide jobs in aviation. Send the coupon now for further interesting Lincoln facts.

LINCOLN AIRPLANE & FLYING SCHOOL
233D Aircraft Bldg., Lincoln, Nebr.

Lincoln is Internationally known . . . known throughout the aviation industry as the school that produces better-trained Pilots and Mechanics . . . men who can fill the most responsible, best-paying Aviation positions. Here's another one of many letters received from Lincoln graduates.

"I immediately secured a position with the Council Bluffs, Iowa, Airways. Later I was fortunate in securing a position with the Chicago Tribune delivering their newspapers to Minneapolis by air. I attribute my success to the high class training received in your school."—Morris Cooper.

Now is the time to start training. Aviation's future is looking brighter all the time. Five leading air lines recently raised their pilots' salaries to $7,000 a year. Mail the coupon below now.

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Please mail me further information about Lincoln School and its unexcelled training and equipment.

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"JUNIOR-ACE"
One and Two Place Sport Planes Offered in Semi-Factory-Built Kits or Complete Fly-Away.
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NEW 26 x 4 WHEELS, Clincher
75 cents each., cash with order
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20 x 4 WHEELS, $4.50; 14 x 3, $5.00
Tires, Tubes Also
Write for list of 15 planes that are really cheap

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Minneapolis, Minn.

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Heath-Henderson conv. motor, $30.00, complete with propeller, mag. carbureter and gas tank. Recently converted, overhauled and tested, never flown.

Emil E. Fachon
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Harlequin

35 H.P. Weight 90 lbs. Complete, less Harley cylinders, $85. Set of parts $28 up. Details for stamp. Copy of Harlequin Flying Manual, 10c.

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LIGHT PLANE MOTOR
25 H.P., Dual Ignition, 2 Cylinder
Weighs 55 lbs.....$65.00
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4 Streamline Flying Wires

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FACTORY BLUE PRINTS
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Three cylinder Anzani, two Bosch mags, prop, etc. Cost new $350. Priced $85. Pioneer compass $100 value, $15. Pietenpol camper pontoons $65. $10 lightplane material $1.35. Complete list Free.

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ZENITH 0-20000 foot ALTIMETERS—$2.49
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10 detailed construction drawings.....$5.00
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Lowest prices on small engines, propellers, hubs, wheels, blueprints, axles, chains, sprockets and transmissions for Iceboats, Snowsleds, Windwagons, Lightplanes, Midget Cars and Stationary or Experimental purposes. Flying Flivver Blueprints, $3. Ford conversion motor Blueprints, $2. Simple, speedy Midget Car Blueprints, $1.50. Storms Iceboat Speedster Blueprints, $1.50. Efficient air propellers at very low prices. Stationary engine, 1½ h.p., $16. Single and twin cyl. motorcycle engines, $12 to $25. Bargain list 10c.
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AERO WHEELS for your lightplane or homebuilt Auto. Make them yourself, tires, wheels, hubs, every part! We show you how. No vulcanizing or other work that can't be done at home with few tools. **PLANS AND INSTRUCTIONS including Auto Blueprint $1.00 Postpaid.** Or send 20c in stamps for circular and **CONSTRUCTION BLUEPRINTS** of the "Mite" 2-seater, cycle-powered, 50 mi. per hour Auto.
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For quick service, order from this ad, cash with order.
4 ft. for Harley and Indian motors.....$ 4.50
4 ft. 6 in. Heath-Henderson, metal tipped.. 8.98
5 ft. Fords, Lawrence, Anzani, metal tipped 9.98
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These propellers are the most efficient made, regardless of name, make, or price. Aeronca type 40 h.p. motor—$98.00, including prop. Super Heath ship, 8 hrs., $198.00. Photos, information including leather bound flying manual, 25c.
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Propellers of Distinction
BUILT by LORENZEN
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Propellers—$3.98 and Up
That give super performance. Manufactured out of select timbers, carefully laminated, scientifically designed by practical engineers. We will bore and attach your hub, carefully crate, and balance at no extra charge. Do not buy until you get our free price lists on Propellers and Ships.

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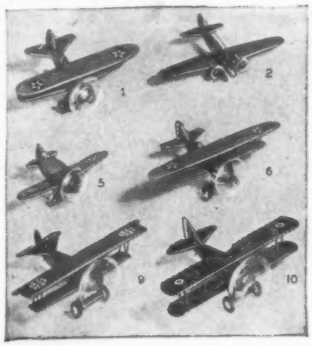
Win one of these Prizes!

Just look at that **FIRST PRIZE!** The very finest **Ranger Bike** that's made—the famous "ACE" Super-DeLuxe Motor Bike with full balloon tires, New Departure Coaster Brake, ball bearing pedals, auto style electric lamp and horn with battery and battery case, red light on rear mud guard, pump, rear carrier, 12-inch Mexican style saddle — **ACTUAL VALUE $55.00.**

1st PRIZE $55 RANGER BIKE

SECOND PRIZE—the famous Keystone Movie Camera and electrically driven movie projector—takes and shows real movies—ACTUAL VALUE—**$37.50.**

THIRD PRIZE—famous Elgin Wrist Watch, 7 jewels, 14K Gold filled case, complete with strap and buckle—ACTUAL VALUE—**$25.00.**



1. Boeing Fighter
2. Boeing Transport
3. Douglas Airliner
4. Red Bullet
5. Gee-Bee
6. Curtiss Hawk P6-E
7. Boeing Low Wing
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9. Fokker D-7
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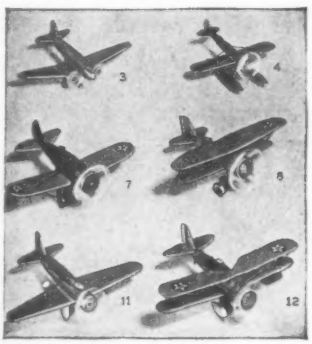
All 8" wingspan except Nos. 4 and 5—6" wingspan.



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Comet announces a sensational new contest, for the purpose of introducing the new Comet line of solid Replicas at only 15c each! Here are the simple rules in this great contest—anybody can enter—anybody has a chance to win one of the thirty big sensational prizes! Start right now—go to the model airplane dealer in your community and ask for the official Comet Entry Blank!

RULES:

1—Any boy age 15 or under may enter.
2—Models must be solid scale, of types and wingspans shown in this ad; other than Comet models may be entered.
3—Enter as many models as you wish. Only one prize awarded to each contestant.
4—Models will be judged for neatness, accuracy and workmanship.
5—Models will first be judged by dealers and must be in dealer's hands by June 2, 1934.
6—Each dealer will send best three models to Comet to be judged in finals on June 16th.
7—Decisions of judges to be final. In case of tie, duplicate prizes will be awarded.
8—Models are to be left for display at Comet until July 31st, then returned to owners.
9—Rewards will be given shortly after final contest is judged.

DEALERS: *Write us for quantity of Entry Blanks—this contest will be a real business-builder for you, if you will co-operate.*

CONTENTS OF KITS

Printed parts on Balsa, colored dope, cement, full-sized plan, and all other parts necessary to build these models. A sensational value at only

15c

OTHER PRIZES

4th Prize—Gilbert Tool Cabinet and Work Bench • **5th**—Eversharp Pen and Pencil Set **6th**—Tennis Racket • **7th**—Football • **8th**—Wilson Catcher's Mitt • **9th**—Fielder's Glove • **10th**—League Baseball and Louisville Slugger Bat • **11th**—Roller Skates, ball bearing Planert • **Next 9 Prizes**—One Year Subscriptions to Popular Aviation, Model News and Model Aircraft Engineers • **Next 10 Prizes**—Comet Kits, including such well-known models as Vought Corsair, Curtiss Falcon, Wedell Williams, Boeing 247, Curtiss Swift.

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but would like to build these new 15c Comet Replica models, buy from your dealer or mail this coupon.

Comet Model Airplane & Supply Co., Dept. PC-44
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Please send me Replica Kits listed:
(No orders for less than 3 accepted; add 5c postage for each kit if you order less than 6; 6 kits for $1.00, postpaid.)

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Name.....

Street and No.....

City and State.....

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GET ENTRY BLANK FROM YOUR DEALER

Go to the dealer in your community who sells model airplane supplies and ask for the official Comet Entry Blank, which you need to enter this contest. If he does not have these blanks, or if there is no model airplane dealer in your community, mail the coupon at the right to Comet, giving us your dealer's name and address, and we will send him a quantity of these blanks, and notify you when they have been sent, so you can get yours.

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and if your dealer has no entry blanks, or there is no dealer in your community, mail the coupon below. Fill in the name and address of your model airplane dealer, or if there is no model airplane dealer, the name of the leading hardware, bicycle, sporting goods, stationery, drug or department store.

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An Airy Chat With the Editor

EVERY SO often, a lot of missing people turn up—or rather, fail to turn up. Then, whenever this happens, it becomes necessary for us to run the "Port of Missing Men" once more.

So-o-o, if you see your name or the name of a friend in this column, don't get scared but answer as soon as possible. It will, in most cases, be highly advantageous for you to do so. And the funny part of the whole thing is that these careless people who leave no trace behind them, have a financial advantage to gain by letting us know where they are located.

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APRIL, in the northern states, sees the opening of the flying season. True, the ground is still rather mushy and there will be flurries of snow, but the twang of the new fresh air awakens the flying spirit and rolls back the hangar doors. April 1, is truly the New Year's day of aviation, so here's the best wishes for a Happy New Year for Aviation.

* * *

AT LAST, we have heard from our old friend McGrigor, our arch critic of former years. He sent us a mighty nice letter for which we thank him. He just forestalled a posting in the Port of Missing Men, for we missed his wholesale razzing during the past few months.

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AND THERE are consistent rumors to the effect that the new heads of the Department of Commerce, Aeronautics Branch, are about to revise the old oppressive regulations that have grounded the majority of the amateurs. Believe me, this is the best news that has seeped into this office in a long long time, and we will be the strongest boosters that the Department has if this rumor develops into fact.

If Mr. Vidal, the present Director of Aeronautics, wishes his statue put right up alongside the statues of Washington and Lincoln, all he has to do is to lead the amateur and private pilot out of the forest of oppression and they'll see that it is done. In any event, the new Director, has already taken a few steps to revise the requirements downward and to extend the liberties of the private pilot. If this is an index of the reforms to be instituted in the future, we'll all be happy.

* * *

I WONDER if the automobile industry intends to take over aviation, just as the old bicycle industry took over the automobile, and in turn finally become the automobile industry? This is entirely possible and probable.

'Way back when the first automobiles started crawling around the streets, the bicycle makers saw the handwriting on the wall and plunged heavily into the automobile game. Notable among these manufacturers were the Columbia Cycle Company, the Dayton Company, The Eldredge Bicycle Company, the Pope Manufacturing Company, and a host of other bike makers. Thomas Jeffery, the builder of the old Rambler bicycle, eventually built the Rambler automobile which finally became the Nash car on the death of Jeffery.

It looks as though the time were ripe for this sort of a revolution in the aviation game, for the airplane builders have made but little commercial progress during the past 20 years in terms of progress in other industries.

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TALKING ABOUT automobiles, it's a cinch that the auto manufacturers have learned a lot about streamlining from the aviation bunch, or at least, they are trying to sell the public on the idea of streamlining, whether the auto streamlining is really streamlining or not. The funny thing about this fad is the fact that streamlining is not such as important factor at the speeds commonly attained by automobiles in everyday driving. It is only when the speeds gets up to about 50 m.p.h. and over, that streamlining actually pays real dividends.

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AFTER an almost unanimous vote by our readers, our Practical Lessons in Aviation again appear in this issue. The writer was surprised and greatly pleased at the tremendous response requesting the return of this series of articles. We have received several hundred demands for the reinstatement of this course—and one negative vote. Well, fellows, here they are again.

* * *

AN INTERESTED reader, who signs himself A. G. McC., has ideas on new departments in P. A. This is his hunch:

The only thing that I can think of that will improve 'ole P. A., is a series of short biographical sketches about prominent pilots. I know that you have published many stories about pilots, but I would like to see this made a regular department, with several short sketches each month.

Well, mebbe we can work this out, but we are so cramped for space as it is, that we'd have to use a shoehorn to work in any more departments. Good idea, though.

(*Concluded on page* 260)

Port of Missing Men

J. ABELSON. We have tried to locate you at Denver, Colo., without success. Please get in touch with us immediately.

I. OESTERBLOM, author of our airship articles. Please drop in and see us, we have something of interest for you.

JACK HARKNESS. Where are you and who are you? We've been compelled to return a number of letters to the postman for the reason that your name and address does not appear in our files.

BESLER BROTHERS. Inventors of the aviation steam engine. Please give us your address for we have received many inquiries about your engine.

PAGING the lady parachute jumper that called on us several months ago. Come up and see us sometime.

JOHN A. DUNNE, machine designer, formerly of East St. Louis, Ill. Where have you been hiding the past six months. I have something of interest for you.

RAOUL HOFFMANN, aeronautical engineer. Hey! Hey! Where are those alignment charts that you promised to work up for us? Can use them, any time.

WANTED! The name and address of a tall dark haired guy, age about 30, who dumped a ton of manuscript on our desk without leaving his name. The mss. dealt with balancing aviation engines.

WANTED! The names and addresses of about two dozen other guys and guyesses who have sent in manuscript and drawings without the formality of attaching their names.

J. D. GRANATH. We have had a number of inquiries concerning your engine, but have failed to locate you at the address given. You can get the letters any time.